AUTOMOTIVE INDUSTRIES

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Industry Recalls Long Fight Against Excise Tax as New Threat is Rumored

Estimated \$150,000,000 Annual Cost Would Precipitate Battle Against This Type of Revenue

by Leslie Peat and L. W. Moffett

LARMED over persistent reports that Treasury officials have a well-defined idea of recommending that Congress restore motor and gas taxes, automotive manufacturers and affiliated trade associations are sending strong protests against such a program to the Treasury Department in Washington.

Officials decline to discuss the prospect of asking that these taxes be reinstated. But they acknowledge receipt of many protests, and are responding with the formal statement that their communications have been made "a matter of record."

The fact remains that Treasury officials are said to have stated specifically that motor and gas taxes would be an easy way to bring revenue into the Federal treasury to assist in overcoming its deficit, which amounted to almost a cool billion dollars at the close of the fiscal year 1931, ended June 30. It is, of course, true that the Treasury Department has not as yet worked out its program for "a sufficiently well-balanced system to provide the revenues on which the government must be able to count from year to year," to quote Secretary of the Treasury A. W. Mellon.

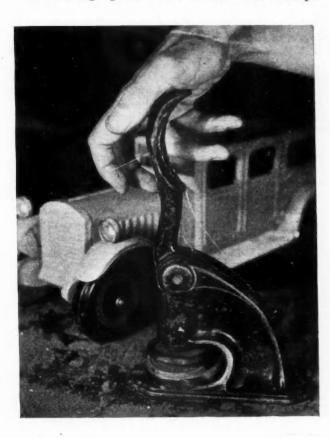
In the same address, broadcast on May 23, he pointed out that the Treasury faces the prospect of a deficit again next year, "although we do not yet know just how great that deficit may be." Mr. Mellon proceeded to say that "Three years ago when Congress was being urged by organizations of business men and other individuals to grant a greater reduction of taxes than seemed warranted, the Treasury pointed out the danger of eliminating certain excise taxes and depending for so large a part of our revenues on a comparatively small number of taxpayers."

This was taken to be a plain implication that the Treasury was opposed to eliminating excise, and certain other taxes. And with the Treasury running into a big deficit, it is stated from sources considered to be altogether reliable, that it has suggested restoration of these excise and introduction of gasoline taxes. The American Motorists' Association, in a recent statement, said that the Treasury Department has proposed a tax of 1c per gallon on gasoline, and that such a tax alone would mean an added burden of \$157,614,000 annually to the motorists of the country. It sharply protested against installation of such a tax, as well as

against reviving the automobile taxes. Both taxes were held to be unjustified. The excise tax on automobiles, from October, 1917, to May, 1928, it was pointed out, cost motorists a total of \$1,119,931,632.

"There can be no possible justification, during peace times, for the Treasury Department's proposal that this so-called 'nuisance' tax should be revived, in view of the fact that the motorists of today are paying approximately \$1,000,000,000 annually in motor vehicle taxes, or almost as much as was raised during the 10 years when the Federal government collected the excise tax," said J. Borton Weeks, President of the American Motorists' Association.

"The average gasoline tax in 1930 was 3.35c per



How Automotive Excise Taxes Compared With Revenue from All U. S. Internal Revenue in Fiscal Years, 1917 to 1927

Fiscal Year	Automobile Trucks	Other Cars and Motorcycles	Automobile Tires, Parts and Accessories	Total Automotive Excise Tax	Ratio of Automotive to Total Int. Rev. (Per Ce
1918					
(9 mg	os.)	\$23,981,268.35		\$23,981,268.35	0.65
1919	\$1,934,222.51	41,991,772.78	\$4,908,276.18	48,834,271.47	1.2
1920	14,471,464.32	76,315,814.26	53,135,513.43	143,922,792.01	2.7
1921	11,640,055.92	64,388,184.22	39,518,009.17	115,546,249.31	2.5
1922	8,404,557.85	56,684,540.30	39,344,664.60	104,433,762.75	3.2
1923	10,678,761.05	92,736,580.44	40,875,148.79	144,290,490.28	4.4
1924	11,510,563.05	112,870,536.57	33,633,609.78	158,014,709.40	5.7
1925	7,807,811.16	94,141,549.29	22,737,384.85	124,686,745.30	4.8
1926	6,817,099.67	113,133,245.91	18,204,849.22	138,155,194.80	4.9
1927					
(6 m	os.)	37,206,262.86	*******	37,206,262.86	.27
Total*	\$73,264,535.53	\$713,449,754.98	- \$252,357,456.02	\$1,039,071,746.53	3.2†

^{*}To December 31, 1926.

gallon. Ten states, thus far this year, have increased their gasoline tax. Imposition of a 1c Federal tax would mean an average gasoline tax of nearly 5c and would add a burden of \$157,614,000 annually to the taxes already paid by motorists."

Excise taxes and gas taxes would obviously injure sales of automobiles and motor trucks, and cause further suffering and additionally affect the treasuries of manufacturers, already undergoing painfully the effects of the business depression.

It is doubted that the administration will recommend a tax program at the next session of Congress. But new taxes are considered to be inevitable with the present prospect of being recommended to the Congress meeting in December, 1932, unless the depression and unemployment become worse and make additional taxes necessary at the session of the coming winter. There can be no doubt that the next session of Congress will see many efforts for various kinds of legislation to relieve the unemployed, and one outstanding suggestion from some members of Congress concerns unemployment insurance, as well as other forms of legislation, some of which are called dole systems, strongly opposed by the administration. It is considered possible, if hardly probable, that it may be necessary to seek new tax legislation at the next session in order to forestall this kind of legislation. The motor and other industries are known to be willing to stand for a reasonable share of taxation, but the motor industry maintains that sales taxes on automobiles and trucks emphatically are not justified, nor a gas tax, which already prevails throughout the states, and therefore would be a form of double taxation.

Should such taxation ever be reinstated, it would bring about another long-fought battle on the part of the industry to get it off the Federal statutes, recalling the able campaign for tax revision led by the National Automobile Chamber of Commerce.

Federal motor excise taxes were first imposed as a section of the War Emergency Revenue Act of October 4, 1917. This measure provided for a flat tax of three per cent on cars and trucks. It was simple to administer and collect, as it was levied upon the cars at the factory, the common practice in excise tax structures. Its simplicity was its bulwark for 10 years.

In February, 1919, the tax on passenger cars was raised to five per cent, and a five per cent tax was levied upon tires, parts and accessories. The three per cent tax on trucks continued.

After numerous conferences during

the following five years, the legislators on Capitol Hill enacted a reduction of the tax on tires, parts and accessories to two-and-a-half per cent in the revision of July, 1924. At that time all trucks with a wholesale value of \$1,000 or less, and all truck bodies wholesaling at \$200 or under, were exempted from the excise tax.

Four months earlier, when the bill was being pushed through the House of Representatives, the automotive industry was treated to the most important legislative battle ever fought on its account. The amendment to the excise bill, calculated to cut 25 million dollars from the motor excise burden, was introduced early in February by Representative McLaughlin, Republican, Michigan, at the request of Representative Robert H. Clancy, Democrat, Michigan, father of the reduction scheme.

Automotive leaders decided that the time had come to spare no effort; it seemed imperative that the tactical move was to have the House go on record against the heavy motor levies; all pressure was brought to bear in order to get the measure through its first ordeal with as large a supporting vote as possible.

Upon Mr. Clancy fell the task of lining up the forces for relief. With a Republican majority, it was necessary to get as large a vote as possible of his colleagues to overcome the natural opposition felt by legislators to tax reduction upon the eve of a presidential election.

Other business, sponsored by the administration and strongly supported by the majority, nearly crushed the measure several times. Mr. Clancy nearly came to blows with Representative Garner, Democrat, Texas, who, too, had a tax plan, and who, the former felt, had fallen to low practices to block the Clancy amendment.

The industry came to Mr. Clancy's aid with organized support. For a week he kept constant vigil for fear some parliamentary move would block the progress of the bill. For three days he held the floor

[†]Total Internal Revenue receipts, July 1, 1917 to Dec. 31, 1926, was \$32,963,627,743. Ratio of total automotive taxes to total Internal Revenue receipts was 3.2 per cent.

almost single-handed. With administration forces with him, then again against him, he succeeded in finally bringing the House into accord for the motor excise tax reduction, which was passed later by the Senate and signed by President Coolidge.

Encouraged by this tax reduction, and reemphasizing the utilitarian character of the motor vehicle as a necessary, economically justified unit in our modern social structure, the industry undertook with renewed vigor the battle for entire elimination of the motor excise taxes. Congress had shown a change of attitude and the strategists of the motor world proceeded

to bear down upon the legislators.

Now, as upon previous occasions, the industry raised its board of strategy to shock-troop strength. The brilliant roll-call of leaders of the industry included Charles Clifton, then president of the N.A.C.C., Roy Chapin, who later headed the organization; Alfred Reeves, its tireless manager, and Pyke Johnson, Washington representative of the Chamber; H. H. Rice, who since has retired from General Motors Corp.; George M. Graham, then of Chandler; C. C. Hanch, of H.C.S., and now manager of the

National Association of Finance Companies, whose memory will always be closely linked with the battles of the ten-year fight; F. J. Haynes, then with Dodge Brothers and now vice-president of Franklin; David S. Ludlum, Autocar; R. E. Olds, M. L. Pulcher, Federal; Windsor T. White, White Co., and Ernest N. Smith, manager, American Automobile Association.

Again, in February, 1926, the three per cent tax on trucks and the two-and-a-half per cent on tires, parts and accessories were repealed after a brilliant campaign supported by the industry.

Then in March of the same year additional relief was attained for the industry when the five per cent tax on passenger automobiles was reduced to three per cent.

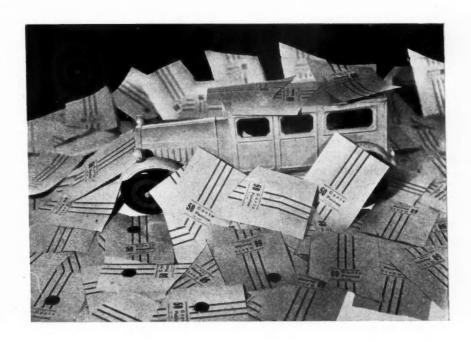
And finally, after a 10-year struggle in conference chambers, and Congressional hearings the motor excise tax was repealed on May 29, 1928.

Thus ended the most important legislative struggle the industry has ever known. It freed the motor car buying public from the "plus tax" which saved car owners from 50 to 158 million dollars a year.

It was a running battle, in which the complexion of both sides was constantly changing. New legislators were elected during the war and post-war decade. New leaders of industry took the field from time to time, and the farm bloc forsook its previous support of the motor tax program and joined the ranks of its opponents, led by the N.A.C.C. and the A.A.A.

The industry held that since the excise tax had been removed from many important commodities, the government had no right to resort to a type of taxation which took revenue for general purposes from one industry and not others at a time of depression.

On the other hand, the motor excise taxes, as above outlined, brought in a total revenue of about \$1,039,000,000 during the decade of its existence. With a wholesale value of cars and trucks produced running around two million dollars a year, an excise tax of three per cent would mean an annual revenue of 60 million.



One Cent Increase in Gasoline Taxes Would Hamper Car Operation

Following are the American Motorists' Association's figures showing exactly what the one cent Federal gasoline imposition would mean in each state, the figures being based upon gasoline consumption in each state last year:

	Added Tax		Added Tax		Added Tax
	Burden to		Burden to		Burden to
State	Motorist	State	Motorist	State	Motorist
Alabama	\$1,725,000	Maine	\$1,086,000	Ohio	\$9,755,000
Arizona	760,000	Maryland	1,823,000	Oklahoma	3,231,000
Arkansas	1,386,000	Massachusetts	5,360,000	Oregon	1,701,000
California	13,355,000	Michigan	7,927,000	Pennsylvania	9,288,000
Colorado	1,708,000	Minnesota	4,014,000	Rhode Island	888,000
Connecticut	2,232,000	Mississippi	1,352,000	South Carolina	1,192,000
Delaware	359,000	Missouri	4,452,000	South Dakota	1,405,000
District of Colum	nbia 805,000	Montana	774,476	Tennessee	2,152,000
Florida	2,270,000	Nebraska	2,288,000	Texas	8,065,000
Georgia	2,241,000	Nevada	186,000	Utah	601,000
Idaho		New Hampshire	647,000	Vermont	469,000
Illinois		New Jersey	5,479,000	Virginia	2,284,000
	4,450,000	New Mexico		Washington	2,711,000
	3,908,000		15,119,000	West Virginia	
Kansas				Wisconsin	
	1,682,000		2,506,000		
Louisiana	1,847,000	North Dakota	1,200,000	Wyoming	366,000

Torsional Vibration Exciting Forces Are Less With Unusual Angles Between

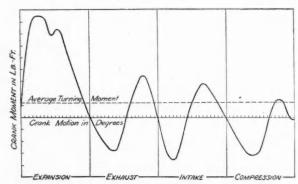


Fig. 1 — Torque curve for single cylinder

ULTI-CYLINDER V-engines generally are designed with such an angle of V that the explosions in the different cylinders follow one another at equal intervals. This gives for the angle between the banks of a 12-cylinder V-engine a value of 60 deg. However, some of the recent engines of this type have been laid out with a smaller angle between cylinder banks, partly, no doubt, to reduce their width, and partly for manufacturing convenience. This gives an uneven sequence of explosions, resulting in a change in the torsional-vibration characteristics of the engine on the one hand, and in a less nearly uniform torque curve on the other. In a low-speed engine with a relatively small number of cylinders an unequal sequence of explosions would be objectionable on account of the non-uniform exhaust reports, but with engines with as many as 12 cylinders it is difficult to distinguish the individual reports, and this objection therefore does not apply.

V-engines with a smaller angle than 720/n deg. between their banks, where n is the number of cylinders, are no novelty, however, the first engine of this type to attain any prominence having been the 12-cylinder

Liberty aircraft engine, which had an angle of V of 45 deg. In that case the object was to reduce drag, or the power required to move the engine through the air at high speed.

It may be of interest to investigate the effect of an uneven sequence of explosions on the torsional vibration characteristics in some detail. Torsional vibration, as is generally known, is due to synchronism between the period of natural

Critical speeds are not affected but amplitudes of vibration are reduced + + + + +

or free vibration of the crankshaft assembly and some harmonic of the curve of crankshaft torque. In investigations of this sort it is customary to start with the torque due to a single cylinder, which constitutes a periodic moment with a period equal to the time of two crankshaft revolutions (Fig. 1). All of the cylinders produce torques following similar curves, which are displaced in phase one with relation to the other by a certain angle. If all explosions are uniformly spaced, then the torque curve due to one cylinder is displaced in phase by an angle equal to 720/n deg. relative to the torque curve due to the cylinder next in order to fire.

According to the principle discovered by Fourier, such a torque curve is made up of an endless number of harmonics, or sine curves, of which the first has the same frequency as the fundamental curve (the single-cylinder torque curve), while the others have 2, 3, 4, 5, etc., times that frequency. In order to produce serious torsional vibration it is necessary not only that the period of one of these harmonics correspond with the period of free torsional vibration of the crankshaft assembly (comprising the crankshaft, flywheel, connecting rods, piston, etc.), but also that these same harmonics of the torque curves of all of the cylinders be substantially in phase. In that case the harmonics of the particular order acting on all of the cranks will tend to twist the crankshaft in the same direction.

The point just made will be rendered obvious from a consideration of the diagram (Fig. 2). This is supposed to be the first harmonic single-cylinder

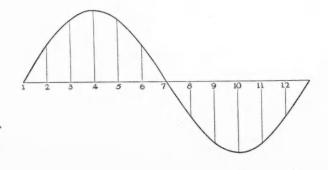


Fig. 2—First harmonic of single-cylinder torque curve + +

In V-Engines Cylinder Blocks

P. M. Heldt

torque, and its period is therefore equal to the time of two crankshaft revolutions. Now let us assume that at any particular moment the torque due to cylinder No. 1 of a 12-cylinder engine is zero, so it may be represented by the point 1 at the left-hand end of the curve. We will call the cylinder next in order to fire No. 2. The torque curve of this cylinder evidently lags behind that of No. 1 by an angle of

360/n deg. = 30 deg.,where 360 deg. represents one cycle. Thus the momentary value of the torque due to cylinder No. 2 is represented by the vertical line marked 2. Similarly the momentary values of the first harmonics of the torques due to all of the other cylinders are marked in Fig. 2 by their respective numbers. It will be seen that while the harmonics due to two of the cylinders are zero, five have a positive and five a negative value, so that five tend to twist the crankshaft in one direction and five in

the opposite direction. From the diagram it might appear that the five cylinders whose torque-curve first harmonics are in the same direction are all at one end of the engine, and the five whose corresponding harmonics are oppositely directed are at the other end of the engine, but such is not actually the case, for if No. 1 is the most forward cylinder, then No. 2, the cylinder next in order to fire, is generally at or near the rear end of the engine. The result finally arrived at is that in a 12-cylinder 60-deg. V-engine the first harmonics of the torques of the different cylinders cancel each other out and cannot produce torsional vibration.

Similar results are obtained for each of the following harmonics up to the twelfth. For the second harmonic, for instance, all of the odd-numbered harmonics in Fig. 2 are duplicated, while the even-numbered harmonics are eliminated. In that case again, therefore, half of the harmonics are in one and half in the opposite direction, and the final result is nil.

The phase difference between the twelfth harmonic of the gas pressure torques due to two cylinders firing in direct succession is $12 \times 30 = 360$ deg., which

due to all of the cylinders tend to twist the crankshaft in the same direction. The twelfth harmonic imparts 12 torque cycles to the crankshaft during two revolutions, and therefore six cycles during one revolution of the shaft, and if the crankshaft has a natural rate of torsional vibration of 21,000 cycles per minute, for instance, then there will be resonance when the crankshaft revolves at 21,000/6 = 3500 r.p.m. While the analysis has been carried

through here for a 12-cylinder engine, similar results are obtained for engines with any other number of cylinders, and, in general, for any V-engine in which there is a uniform sequence of explosions, the lowest harmonic of the single-cylinder gas-pressure torque for which there is phase equality for all cylinders and which therefore can cause (first order) torsional vibration is that designated by the same number as the number of cylinders in the engine. Torsional vibration can be caused also by harmonics twice, three times, etc., as large as this; that is, in the particular case considered in the foregoing by the twenty-fourth, thirty-sixth, forty-eighth, sixtieth, etc., harmonics.

means that these harmonics are in phase and those

Now assume that the angle of V of the 12-cylinder engine, instead of being 60 deg., is only 50 deg. Then explosions will follow one another at intervals corresponding to crank motions of 50 and 70 deg. respectively, and the phase differences between the first harmonics of the torque curves of the cylin-

ders will be half these values, or 25 and 35 deg. (because a cycle is equal to two crankshaft revolutions). The phase differences between the twelfth harmonics will be 12 times as great and therefore will be equal to $12 \times 25 = 300$ deg. and $12 \times 35 = 420$ deg. This

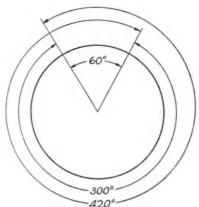
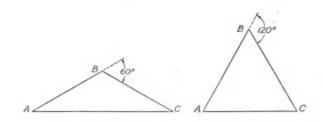
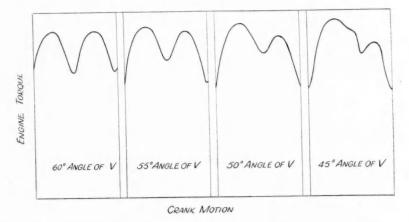


Fig. 3 - Phase relation between twelfth harmonics in 12-cylinder engine with 50deg. angle of V



of cylinders +

Fig. 4 (left)—Addition of twelfth harmonics of torque due to the two banks of cylinders Fig. 5 (right)-Addition of twenty-fourth harmonics of torque due to the two banks of cylinders + + + + + +



phase relationship is shown graphically in Fig. 3. It will be seen that the actual phase difference is 60 deg. The phase difference between the twelfth harmonic of the gas pressure torque from any one cylinder and from the cylinder second in order after it is 300 + 420 = 720 deg. This is equal to two complete circles, which means that there is phase equality between these harmonics. Hence, the twelfth harmonics from the 12 cylinders divide into two groups, those in each group being in phase with each other and 60 deg. out of phase with those of the other group. The two groups of harmonics can be added vectorially, as is done in Fig. 4, where A-B is the sum of the harmonics due to one-half of the cylinders and B-C the sum of the harmonics due to the other half of the cylinders. The resultant A-C, instead of being twice A-B, as it would be if all harmonics were in phase, is only 1.777 times as great. Therefore, so far as the highest critical speed is concerned, a 12-cylinder engine with a 50-deg. angle of V will be less subject to torsional vibration than a similar engine with 60-deg. angle of V. The critical speeds will be the same, but the amplitudes of the exciting forces will be less in the case of the smaller angle of V, hence the amplitude of vibration should be less, and smaller damping forces should suffice.

To put the foregoing on a more general basis, let the angle between the two banks of cylinders of a 12-cylinder engine be designated by $60^{\circ} - a$. Then the phase difference between the first harmonics of successive explosions will be $30^{\circ} - a/2$ and the phase difference between the twelfth harmonics of successive explosions will be $12 \times (30^{\circ} - a/2) = 360^{\circ} - 6a) =$ 6a deg. If the sum of the six twelfth harmonics which are in phase is designated by F, the combined exciting force of the twelfth harmonics from all twelve cylinders is $2F \cos 3a$. This evidently is zero when 3a is equal to 90 deg. and a therefore is 30 deg., which would make the angle between cylinder banks $60^{\circ} - 30^{\circ} =$ 30°. In that case the phase difference between the twelfth harmonics of the two groups of cylinders would be $6 \times 30 = 180^{\circ}$, which means that the harmonics would be in direct opposition and would cancel each other out. The same would hold true when 3a is equal to 270 deg. and a therefore is 90 deg., in which case the angle between cylinder banks would be 60 — 90

The expression for the combined exciting forces is equal to 2F if 3a is either 0 or 360 deg., so that a is

either 0 or 120 deg., and $60^{\circ}-a$ (that is, the angle between cylinder banks) is either 60 deg. or minus 60 deg. This is the condition resulting in torsional vibration, whereas that previously referred to (cos. 3a=0) results in a cancellation of all torsional vibration-inducing moments.

The above applies to the highest critical speed of the crankshaft, which designers usually manage to place above the normal operating speed of the engine, and what is really the most important is the next highest, which in the case of a twelve-cylinder engine is due to the twenty-fourth harmonic of

the torque of the single cylinder, for which there is resonance at a crankshaft speed equal to one-twelfth the rate of torsional vibration of the crankshaft assembly. The phase angles between these harmonics from cylinders following one another in the firing order are $24 \times 25 = 600$ deg. and $24 \times 35 = 840$ deg. Since a phase difference of 720 deg. is synonymous with phase equivalence, these figures represent a phase difference of 120 deg. between the twenty-fourth harmonics from the two sets of cylinders. The harmonics therefore combine vectorially as shown in Fig. 5. In this case the resultant, A-C, is only of the same value as A-B, the sum of the harmonics due to one-half of the cylinders, instead of being twice as great.

In the case of the thirty-sixth harmonics those due to the two sets of cylinders are 180 deg. apart, or in direct opposition, so these harmonics will not cause any first order vibration at all. It is only in the case of the seventy-second harmonics of the torque due to a single cylinder that those from all of the cylinders are in phase. Now, resonance between these harmonics and the crankshaft assembly occurs at so low an engine speed that no serious results need be feared. For instance, if the natural period of vibration of the crankshaft assembly were 21,000 cycles per second, then the critical speed due to the seventy-second harmonic would be $(2 \times 21,000)/72 = 583$ r.p.m. The exciting forces due to the seventy-second harmonic with an angle of V of 50 deg. would be no greater than with an angle of 60 deg., while the exciting forces for all of the higher critical speeds corresponding to the sixtieth, forty-eighth, thirty-sixth, twenty-fourth and twelfth harmonics would be smaller than with an angle of V of 60 deg., those due to the thirty-sixth harmonic being eliminated entirely. From the standpoint of torsional vibration the engine with an angle of V somewhat less than 720 deg./n therefore has the advantage.

The uniformity of crankshaft torque is, of course, slightly impaired by using an angle of V giving an unequal spacing of explosions. This is shown by Fig. 6, in which are plotted crankshaft torque curves for twelve-cylinder engines with angles of 45, 50, 55 and 60 deg. between cylinder banks. It is clearly shown that as the angle between cylinder banks decreases the fluctuations of the torque curve increase, and for an angle of V of 45 deg. the ratio between maximum and minimum values of the crankshaft torque is about the same as for an eight-in-line engine.

JUST AMONG Ourselves

Seasonal Slump In Book Reading

OT weather, beckoning golf links, and enticing tennis courts have caused a big slump in our reading curve lately, while such books as we have read in the last month or so have been ones which everybody else has finished several years ago.

We've just read Sinclair Lewis' "Arrowsmith," for instance, which several of our automotive friends have spoken of as the Nobel prize winner's best book—in fact, the only one of this author's which they ever liked.

It is a good book-no doubt about that. We think we know the reason for our friends' liking of it, even though they dislike Lewis' other volumes. Like most likes and dislikes, this one, we believe, is strictly emotional in essence. In "Arrowsmith" Lewis is definitely sympathetic with his hero and is comfortably tolerant even in his lampooning of several other characters. One finds none of the bitterness and the scathing denunciation which characterized Main Street and others of Lewis' books.

And such criticism as is contained in "Arrowsmith" is of doctors—a group which the American business man is more apt to approve of harpooning more than he is to approve of harpooning American business men—or even American ministers.

The Rainbow's End Is Not in Dreams

BUT even definite automotive reading has been neglected, too. "Self-management in Sell-

ing," by David R. Osborne, training director, Studebaker Corp., has reposed unopened on our desk for several months.

We finally turned back its covers the other day and found more of wisdom on its first text page than we've found in many pages of more pretentious volumes. Sir Joshua Reynolds is quoted as author of the saying that:

"There is no expedient to which man will not resort to avoid the real labor of thinking."

Then shortly follows this pregnant paragraph: "Even the most fantastic plans and schemes never fail to get our eager interest—providing only that they will permit us to avoid responsibility and to go on dreaming hopefully that our desires can be made real without all the travail inherent in the exercise of our own thought and our own judgment."

Principles of Our Business Organizations

Some time we're going to finish that book. But not for a while. We're now engaged in driving our way through what appears to us to be perhaps the most important fundamental contribution to modern business literature and thought ever written. It carries the inane title of "Onward Industry," a name given it, we choose to believe, by its publishers, Harper & Brothers, for sales purposes. Certainly that title is not indicative either of the character or the content of the volume.

Its sub-title, "The Principles of Organization and Their Significance to Modern Industry," gives a true indication of what

the book is about and the manner in which its subject matter is approached.

"Onward Industry" has been written by J. D. Mooney, president, General Motors Export Corp., and Alan C. Reiley. Having thus far completed only about 100 of its 500 and some pages, we already are prepared to urge its thorough perusal by every executive in the automotive industry. The book has its roots deep in philosophy; its branches encased in logic, and its leaves brilliantly colored with basic economics.

Hard Reading, But Worth It

FOR every 100 executives who start to read this volume, we predict about ten will finish it. And about two of these ten will comprehend and profit by it. We make that statement in praise, not in derogation of the volume. It treats of matters of deepest import to modern industry and business, of matters which cannot be discussed in one-syllable words or one-cylinder thoughts. It sets out to do a fundamental job in a fundamental way, and courageously does it, braving the inevitable criticism of being branded as theoretical and high-

Until we've finished it we can't, of course, properly discuss the ideas contained in it. We can say at the moment, however, that it's the hardest and most enjoyable reading we've done since Kayserling's "Travel Diary of a Philosopher."

Why Style Sells Cars

"ENTHRALLMENT to style," says H. G. Laignier, V.P., Federation of Automobile Dealers Associations of France, "arises in the commercial realm from the desire of the elite to distinguish themselves from the masses and the desire of the masses to emulate the elite."—N.G.S.

Dynamic Loads Used as Basis for Durability of Spur Gear Teeth

New formulae are more in accord with actual conditions than former ones and allow for manufacturing variations + + + + + + +

HE nature and extent of the actual working (or dynamic) loads on gear teeth have long been an open question. In the absence of any evidence to the contrary, these dynamic loads generally have been considered as being directly proportional to the applied loads. Certain velocity factors have been established by running cast-iron gears to destruction under varying speeds and loads. The applied loads which cause failure have then been divided by the static load which would cause a similar failure and the quotients thus obtained have been used as velocity factors. For example, if a pair of cast-iron gears, running at a certain pitch line velocity, should fail under a transmitted load of 1000 lb., and these same gears would fail under a static load of 3000 lb., the velocity factor for this speed would be taken as one-third. It is then assumed that under these same velocity conditions the dynamic load would be equal to three times the applied load, so that with an applied load of 250 lb. the dynamic load would be equal to 750 lb.

In practice, this velocity factor has been used to reduce the safe working stress of the material by multiplying the safe static stress, which includes a liberal factor of safety, by the velocity factor. The Barth factor, 600 / (600 + V), or some modification of it

has been generally used. * Paper presented at the annual meeting of the American ear Manufacturers Association, Buffalo, N. Y., May 9. Slightly

The analysis of dynamic loads, which is primarily the result of suggestions from Carl G. Barth, has been applied successfully to the results of three distinct and independent types of tests: First, the separation of the tooth surfaces as indicated by a break in the electric circuit between the teeth; second, surface fatigue tests where the failure of the tooth surface was taken as a measure of commensurate loads and loads which also set up compressive stresses approximately equal to the ultimate compressive strength of the material; and, third, actual breaking tests on cast-iron and semi-steel gears. The extent of the errors on the gears tested has ranged from 0.0005 to 0.0060 in., and in other than the breaking tests a wide variety of materials have been used. The computed results from this analysis, considering the nature and extent of the many uncertain factors such as the structure of the material and observational errors, etc., have been remarkably consistent, generally within 25 per cent of each other. It would appear from this evidence that the analysis of dynamic loads and the proposed method of determining dynamic loads on spur gear teeth can be safely employed and will give a far closer measure of the truth than any of the present methods.

Errors on gear tooth profiles together with their deformation under load cause the masses on the driving and driven shafts to change their velocities slightly. This change in momentum and velocity tends to cause the tooth surfaces to separate. This separation

Table I. Values of C

Materials	Tooth Form		Measured Error					
Materials	10	oth Form	.0005"	.001"	.002"	.003"		
Cast iron and cast iron	141/2	deg. inv.	400	800	1,600	2,400		
Cast iron and cast iron	20	deg. full depth	415	830	1,660	2,490		
Cast iron and cast iron	20	deg. stub	430	860	1,720	2,580		
Cast iron and steel	141/2	deg. inv.	550	1,100	2,200	3,300		
Cast iron and steel	20	deg. full depth	570	1,140	2,280	3,420		
Cast iron and steel	20	deg. stub	590	1,180	2,360	3,540		
Steel and steel	141/2	deg. inv.	800	1,600	3,200	4,800		
Steel and steel	20	deg. full depth	830	1,660	3,320	4,980		
Steel and steel	20	deg. stub	860	1,720	3,440	5,160		

Calculating Strength and

Table 2. Values of K

by Earle Buckingham

Materials	Assumed Fatigue Limit in Compression. Lb. Per Sq. In.	Maximum Specific Compressive Stress	к	
Cast steel and	60,000	60,000	43	
cast steel	60,000			
Forged steel and	80,000	65,000	50	
cast steel	60,000			
Forged steel and	80,000	80,000	76	
forged steel	80,000			
Hardened steel and	220,000	90,000	96	
cast steel	60,000			
Forged steel and	80,000	80,000	114	
semi-steel				
Hardened steel and	220,000	85,000	135	
phosphor bronze	70,000			
Hardened steel and	220,000	90,000	145	
semi-steel				
Heat-treated steel and	120,000	120,000	171	
heat-treated steel				
Semi-steel and	90,000	90,000	193	
semi-steel	90,000			
Hardened steel and	220,000	130.000	201	
heat-treated steel			-	
Hardened steel and	220,000	220,000	576	
hardened steel			5,0	

These figures represent the limiting load conditions and make allowance for the cold-working received in operation. The dynamic loads should be such that somewhat lower values are used, depending upon the margin of safety required for any specific application. These figures are also based upon smooth tooth surfaces.

is resisted by the applied load. After separation, the surfaces of the teeth come together again with an impact. The additional or increment load set up by this impact depends primarily upon the amount of change of momentum in the revolving masses caused by the effective errors in the gear tooth profiles. With metal gears, where the effective error is primarily the initial error in the gear tooth profiles, and the deformation under load is but a small part of the effective error, this increment load will not be directly proportional to the applied load but will be almost independent of it. On non-metallic gears, on the other hand, where the largest part of the effective error is the deformation under load, this increment load may be very nearly directly proportional to the applied load.

To sum up, the maximum dynamic loads on moving parts of a mechanism are impact loads, their intensity being the sum of the transmitted load and an increment load. This increment load is very near to a constant with metal parts for any given speed on any given mechanism. It is only when non-metallic parts with a very low modulus of elasticity are involved that the increment loads approach the condition where they are practically directly proportional to the applied loads. The stresses set up by these impacts must not exceed the compressive fatigue limits of the materials employed if excessive wear is to be avoided. For metal parts, where the increment load is practically independent of the intensity of the applied load, a margin of safety would appear to be a more logical value to use than a factor of safety. Dynamic loads on metal parts are not directly proportional to the applied loads, hence the use of velocity factors in such cases is not only incorrect but is also misleading.

The various equations required for a complete and detailed analysis of the dynamic load phenomena are many and complex and require the use of values for many factors. For general use, it is often desirable to have simple equations which will give a reasonably close approximation to the actual load conditions. It should be fully appreciated, however, that such a formula can cover only the normal or average conditions. As with all other engineering standards and approximate equations, exceptional conditions should receive special consideration. Thus, for example, where gears are to be used for an aeroplane propeller drive and the weights of the gear blanks have been reduced to a minimum, the mass conditions will be much below the average and the use of these general equations may give increment load values somewhat larger than the actual ones. On the other hand, if the gear is very large and the gear blank is also to act as a flywheel, the mass conditions may be very much greater than the average and the use of these general equations may give increment load values somewhat smaller than the actual ones.

As noted before, the maximum dynamic load on gear teeth is the sum of the applied load and an additional or increment load resulting from the inertia of the masses and the variations in velocity set up by the action of the effective errors in the gear teeth. This maximum load is but momentary, yet the teeth must be strong enough to carry it.

The following equations apply to metal spur gears:

When W = total tooth load transmitted, lb.

T =width of gear face, in.

f = applied load, lb. per in. of face

V = pitch line velocity, ft. per min.

I =increment load, lb. per in. of face

 $f_2 = \text{load in lb. per in. of face required to}$ deform teeth the amount of the effective

C =tabulated value representing load required to deform tooth of given material and form a given amount

 W_d = total maximum dynamic tooth load. lb.

$$f = \frac{W}{T} \qquad (2)$$

$$I = \frac{0.05 \ V \ f_2}{0.05 \ V + \sqrt{f_2}} \dots (3)$$

$$W_d = T (f + I) \dots (4)$$

The value of C will be directly proportional to the error. As the moduli of elasticity of cast iron and bronze are nearly alike, the values of C given in Table 1 for cast iron can also be used for bronze.

The foregoing equations and tables will give a close approximation to the intensity of the maximum instantaneous dynamic load. We must next have some measure of the beam strength of the gear teeth to insure that they will be strong enough to withstand this dynamic load without breaking. For this purpose we have the Lewis formula, which is as follows:

$$W_s = SpTy \dots \dots (5)$$

 $W_s = SpTy \dots (5)$ Where $W_s =$ limiting static tooth load for beam strength, lb.

S =elastic limit of material, lb. per sq. in.

p = circular pitch of teeth, in.

T =width of face of gear, in.

y = tooth form factor

We must also have some measure of the durability

of the surfaces of the gear teeth so as to avoid excessive wear. For this purpose we can use the following equations and values:

When $W_{\rm w} =$ limiting static tooth load for wear, lb. D = pitch diameter of pinion, in.

T =width of face, in.

Q = ratio factor

K = load-stress factor

n = number of teeth in pinion

N = number of teeth in gear

 $E_1 \& E_2 = \text{modulus of elasticity of material}$

 $S_{\rm f}$ = compressive fatigue limit stress for material, lb. per sq. in.

A =pressure angle of tooth form

Then
$$Q = \frac{2N}{n+N}$$
(6)

$$K = \frac{S_1^s \sin A}{1.400} \left(\frac{1}{\overline{E}_1} + \frac{1}{\overline{E}_2} \right) \dots (7)$$

$$W_{\mathbf{w}} = D \ T \ K \ Q \dots (8)$$

In order to simplify the use of this material, Table 2 has been prepared which gives values for K corresponding to the probable fatigue limit stress for the materials. For the sake of simplicity, a pressure angle of 141/2 deg. has been employed in computing these tabulated values.

As an example of the use of this material we shall consider the following:

A pair of 8 diametral-pitch gears, 141/2 deg. tooth form, of 33 and 59 teeth, 1.250 in. width of face were used in a machine, running at a pitch line velocity of about 300 ft. per min. and transmitting a tooth load of about 400 lb. Originally these gears were of semi-steel and had operated satisfactorily for several years. Recently they were replaced with machine-steel gears, the material being about the same as S.A.E. 1045 steel, and in about eight weeks they were worn so badly as to be practically worthless.

The extent of the error to be expected on well-cut gears of this size is about 0.002 in. Using this value as a measure of their accuracy, we have the following for the original semi-steel gears:

$$f = \frac{400}{1.25} = 320$$
 (Equation 2)

$$V = 300$$

$$T = 1.25$$

From Table 1 we obtain C = 1600

$$f_2 = 320 + 1600 = 1920$$
 (Equation 1)

$$I = \frac{0.05 \times 300 \times 1920}{0.05 \times 300 + \sqrt{1920}} = 500 \text{ (appr.)}$$
 (Equation 3)

$$W_d = 1.25 (320 + 500) = 1025 \text{ lb.}$$
 (Equation 4)

$$W_{\rm s} = \frac{36,000 \times 3.14 \times 1.25 \times 0.103}{8} = 1828 \text{ lb.}$$
(Equation 5)

Here we have a margin of safety of 800 lb. which is double the applied load. The factor of safety would be equal to 1.78, which seems low, according to our usual ideas, yet it has proved to be ample in this case.

We will next examine the wear conditions on this drive. For the solution of equations (6) and (8) we have the following:

$$D = 4.125$$

$$T = 1.250$$

$$n = 33$$

$$N = 59$$

$$Q = \frac{118}{92} = 1.282$$
 (Equation 6)

From Table 2 we obtain K = 193

$$W_{
m w} = 4.125 \times 1.25 \times 1.282 \times 193 = 1276$$
 (Equation 8)

This last value which represents the limiting load for wear is about 250 lb. greater than the dynamic load. In other words, we have a margin of safety of 250 lb. which seems somewhat small, yet it has proved to be sufficient in service.

We will next compute in a similar manner the dynamic load conditions on the machine-steel gears. For these we have:

$$f = 320$$

$$\begin{array}{c}
f = 320 \\
V = 300
\end{array}$$

$$T = 1.25$$

From Table 1 we obtain C = 3200

whence
$$f_2 = 320 + 3200 = 3520$$
 (Equation 1)

$$I = \frac{0.05 \times 300 \times 3520}{0.05 \times 300 + \sqrt{3520}} = 710$$
 (Equation 3)

$$W_d = 1.25 (320 + 710) = 1288 \text{ lb.}$$
 (Equation 4)

$$W_{\rm s} = \frac{90,000 \times 3.14 \times 1.25 \times 0.103}{8} = 4547 \text{ lb.}$$
 (Equation 5)

Here we have, for beam strength, a margin of safety of about 3250 lb., and a factor of safety of 3.53. But the trouble here is excessive wear and not breaking of the teeth.

For the wear load conditions we have:

$$D = 4.125$$

$$T = 1.25$$

$$T = 1.250$$

 $Q = 1.282$

And from the equation (7) using a value of S_t equal to 90,000 lb. per sq. in.:

$$K = 96$$

Whence from equation (8) $W_{\rm w} = 635$ lb.

In this case the dynamic load is more than double the limiting load for wear, hence the rapid wear which took place is something to be expected. It might also be remarked that this example from actual experience makes still another check on the general validity of the proposed method of computing the dynamic loads and the ability of the gears to withstand them.

A New Piston Design

N a new piston described by E. J. Mahle of Stuttgart I in a recent issue of Allgemeine Automobil-Zeitung, an L-section ring of high-nickel steel is set into the mold at the upper end when the piston is cast, to provide a top bearing band. The material used has a very low coefficient of heat expansion, and therefore maintains a substantially constant clearance, and it also does not soften materially under the effects of the high temperature at the upper end of the piston, as does

The objects aimed at are to protect the top piston

the rings, and to reduce the wear on the cylinder walls. The nickel-iron alloy used contains 31 per cent of nickel, and has a coefficient of heat expansion of only 0.0000022 per deg. F. For a piston of about 31/4 in. diameter, the clearance at the wear ring is made 0.0015 in., while the clearance on the land S2 is made

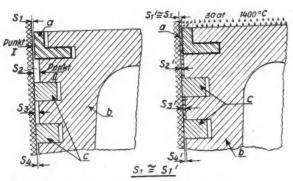
ring against the heat and pressure of the combustion

chamber, to improve the conditions of lubrication in

0.010 in., on land S3, 0.008 in., and on the skirt at S4, 0.0015 in., in accordance with the regular practice for Nelson Bohnalite pistons.

The advantages of this picton design are said to be obvious when taking down a cylinder head from an engine on the test stand, from the condition of the piston tops and the spark plugs. No oil gets by the top ring, because the clearance between the wear ring and the cylinder wall is too small. With aluminum pistons, it has been the general experience that carbon particles embed themselves in the surface of the top land, the aluminum there getting quite soft in operation, owing to the high temperature, and these carbon particles then accelerate the wear of that portion of the cylinder bore over which they pass. Bearing conditions between the high-nickel-iron ring and the gray-iron cylinder bore are said to be very favorable.

It is stated that a number of automobile manufacturers have these "Equidilatans" pistons in experi-



Detail of Equidilatans piston when cold (left), and hot (right)

Vast Area of China Hardly Scratched of Improved Roads

by Norman G. Shidle

HINA has nearly 40,000 miles of roads today suitable for motor traffic. And something less than 40,000 motor vehicles are in operation

A mile of road for every motor vehicle! That sounds like the highways of Paradise to the average American Sunday driver who feels expansive when he gets a full four yards all to himself.

But-

Yes, you've guessed it—there's a hickey in this ap-

parent driver's paradise.

Several of them, in fact. The main one, though, is well, remember that story about the golfer who died and went to hell? Remember how His Satanic Majesty showed the newcomer over the most beautiful golf course that had ever been seen? He looked out over velvety fairways, soft to the tread and green to

the eye; he gazed at finely trimmed greens, undulating in the soft sunlight. He swung with eagerness one after another the finest set of matched clubs he had ever seen. He saw that the course was absolutely clear; no one to hold him up ahead; no one to press from behind.

"This is perfect!" he exclaimed. "This is what I thought heaven would be like—not hell. Give us a ball and let's go," he cried.

Sadly the Devil turned to him and said: "There aren't any balls anywhere. That's the hell of it!"

Well, this idea of a mile of road for every vehicle in China works out in somewhat the same way, because in most of the provinces privately owned passenger cars just aren't allowed to run on the highways.

"The tendency of provincial authorities themselves to operate or to grant franchises to private bus companies for the exclusive use of given roads limits the opportunity for passenger cars.

"The right to operate motor cars over China's newly constructed roads is still chiefly reserved to Government officials or to bus line interests, private citizens having little opportunity, or even as yet the desire, to utilize existing roads outside of those at the foreign treaty ports."

So says A. Viola Smith, American Trade Commis-

sioner, Shanghai, China, in a new Department of Commerce trade promotion pamphlet called, with usual governmental enthusiasm, "Motor Roads in China." So it must be true, along with all the other exotic facts culled from this same bulletin, upon which the discussions in following paragraphs are based.

sions in following paragraphs are based.

When Miss Smith speaks of "China's newly constructed roads," she means "newly constructed." Back in 1921—just ten years ago—less than 100 miles of improved roads existed in all of China (exclusive of foreign possessions). Now the total is estimated conservatively at 39,938 miles.

If our slide rule is working correctly that's an increase of about 399 per cent.

And what's more, there are 5061 miles of new roads under construction in China right now with definite plans projected for the building of 31,099 more miles

within the next twenty

years.

Automotive development in China, it would seem, is moving along paths exactly opposite to those which it followed in the United States. Over here, the individually owned and operated passenger car formed the basis for the first great development in motor vehicle use, with the bus and truck coming along somewhat later more or less as corollaries to the passenger car era.

- In China, on the other hand, facts in this bulletin indicate, the bus and the truck have been and for some time will continue to be the only important motor units to have widespread use. Passenger car development, if it comes at all on a major scale, seems likely to follow the bus

likely to follow the bus and truck growth by many years. "Whatever expansion may come in the automotive field in China," Miss Smith says, "will undoubtedly be confined for several years to that of the motor trucks for bus service rather than for privately owned vehicles."

How very different in fundamentals is this Chinese motor vehicle growth from that which we have watched in the United States is further shown by the relations between these multiplying commercial vehicle lines and the railroads, which in China are government controlled. While rail and highway carriers over here

Since 1921 China has built an estimated total of 39,938 miles of improved roads.

There are now 5061 miles of new roads under construction.

There are definite plans for extending the road system 31,099 miles.

There are less than 40,000 motor vehicles in operation in the Empire—a vehicle per mile.

by Its 39,938 Miles

have been waging commercial war, the whole highway development in China—under which the buses and trucks are being sold concessions—is going forward under the direction of the Minister of Railways.

And while railroad experts in this country have been busy trying to prove the bus and truck to be uneconomic units of transportation in competitive instances, we find this government report concerning China stating that:

"While railways may furnish a cheaper form of transportation, the financing of such undertakings presents a very real problem to China. The initial investment represented in the construction of railways, as against that for motor highways, presents many arguments in favor of highways over railways at this period in China's domestic life.

"If the progress which has been made in road construction within the past five years amid civil strife and turmoil is in any sense a measuring standard for the future," Miss Smith continues, "there is reason to believe that within the next five years motor-highway construction will greatly exceed new railway development and will thus furnish to the country a system of transportation which the laying of rails could not hope to accomplish for years to come."

The extremely high cost of very low cost transportation is strikingly visualized by study of transport costs in China where human beings function frequently as beasts of burden. Plenty of people are prone to believe that the availability of cheap coolie labor in China makes this form of carrying goods and people cheaper than our more modern Western methods.

This idea is utterly fallacious, Miss Smith shows. She quotes a recent publication by an American commercial attache to China to the effect that:

"The human beast of burden in China is 15 times as costly as a luxurious railway train in America; an American railway train will haul a ton of wheat for what it costs to haul a picul (133 1/3 lb.) the same distance by coolie carrier in China.

"An illuminating story regarding transportation costs in Shansi," Miss Smith relates, "is that of a shipment of 20,000 piculs (about 1400 tons) of Manchurian grains which arrived at Taiyuan by railway for transportation to Lingfeng, about 233 miles distant, by carts and pack animals for famine relief.

"The cost of transporting this shipment is reported to have been \$220,000 silver or 79c per ton mile. While railways might have hauled this tonnage for 1.9c per ton mile, there are no railways in that territory and to construct one would cost in the neighborhood of \$81,000,000 silver.

"The same shipment might have been transported by tractors and trailers over an existing road at a cost of between \$35,000 and \$40,000 silver."

The tremendous growth of highway mileage in China, which can be expected to bring about transport economies such as those illustrated in these incidents, got its first big impetus, Miss Smith says, from the road building programs carried out under the direction of the American Red Cross to alleviate famine-stricken districts in 1920.



"The China International Famine Relief Commission," the report states, "has doubtless done more than any other single medium in the actual construction of roads and in the extension of the road building program in China.

"In many places the commission has been able to carry on construction irrespective of military operations and the instability of local governments. It aims to have local authorities with whom it is cooperating match, with funds or an equivalent value in labor and materials, the China International Famine Relief funds expended on certain projects."

The first big forward step from a national viewpoint came, however, when in January, 1929, the Minister of Railways ordered the organization of the National Highway Planning Commission. This group was made up of responsible delegates from nineteen provinces and three men appointed by the Minister of Railways. It presented plans for a national system of highways after three months' study. These plans were approved and adopted by the State council and the Legislative Yuan. "As a result thereof highway laws were promulgated in September, 1921, as the first step toward realization of this national plan."

(Turn to page 135, please)



Production LINES

Production Lines of the Industry No. 1

Here is a view of one of the Waukesha assembly lines designed to handle engines weighing more than a ton. The layout has been planned to reduce fatigue and provide good daylight condi-

The Waukesha Motor-Company builds internal combustion engines from 15 hp. to over 300 hp., on a production basis + +

Utility and Decoration

Chrome plating is entering a new field of utility. Much has been said in this publication about its properties as a protective coating as well as resistance to abrasive action. Rumor had it recently that some one was exploring the possibility of plating cylinder barrels. Certainly interesting. We'd like to know how the idea worked out.

But this looks like a real hot tip. One progressive company is experimenting with chrome plating crankshaft bearings and pins. Should add thousands of miles to the life of these journals. Of importance is the fact that no grinding or lapping is necessary. Merely a hand polishing after plating. No sulphates used in plating bath. Masking of checks, etc., by application of "stop-off" lacquer, later removed with caustic soda.

All Welded

Is the all-welded car in the offing? More and more, welding is influencing design in every field. Why not welded chassis frames? An important auto maker is trying to find out. Some experimental frames already have been built, and showed failures on initial tests. But what of it? These frames followed orthodox design. Welding probably demands special technique. If the idea is workable, welding engineers will find a way.

Paths of Progress

Automobiltechnische Zeitschrift re-ports that flywheels are coming into use on machine tools to smooth out differences in torque due to changes in cutting resistance. Thus the Pfauter firm manufactures automatic milling machines for wheels, with one or more flywheels in order to equalize the torque as much as possible.—(P.M.H.)

Welding by Torch

Some fine pointers on welding will be found in the "Manual of the Electric Torch," describing Weco-Weld by the Warner Engineering Corp., Pomona, Calif. It is a portable electric welder operating on 110 or 220 volts A.C., 50 or 60 cycles. In principle the torch is a device which allows current to form an arc between two carbon electrodes. Its characteristic is a nonoxidizing flame. Indicated for hard solders, which may be introduced in their natural state. Many other diffi-cult jobs are described.

Settles Coolant Question

Can we learn new tricks from other industries? Emphatically yes.

Talked with a man the other day who designed and built a 13,000-gal. central coolant filtering system for a prominent Eastern parts maker. The chemical industry made its contribution to this job. Coolant from grinding machines piped to a chemical settling tank instead of usual filter. Through action of slowly turning scrapers, sludge and residue settles to bottom. At the top, oil and lighter liquor are scraped off. Distilled coolant then goes back to machines. Sludge is taken regularly from the bottom. Coolant lasts indefinitely; stays sweet.

National Planning

According to The Week's Work (U. S. Chamber of Commerce), July 11, 1931, a committee is expected to report on cyclical fluctuations in industry. It has been found that several hundred concerns are using some regularization plan, while many others are trying temporary measures. The committee is exploring the possibilities of a wide cooperative trade association effort. Which is one of the planks in our discussion on wages and employment in Automotive Industries, July 4, 1931.

Turning Faster

One of our attention callers (credit H. Broun) reports excitement in the field of automatic turning machines. Have you felt any persistent tendency toward multiple spindle equipment? How about the double-end machine? What is your reaction in re single spindle vs. multiple? Let's hear from About Wire Rope

Walter Voightlander, American Cable Co., has some good advice for maintenance men. Concerning care of wire rope on shop cranes and electric hoists, he says: A factor frequently responsible for early rope failure is lack of proper lubrication. Practically all the cores of good brands of wire rope are thoroughly impregnated with a commercial, chemically neutral rope oil. While the core retains a liberal supply of this lubricant, frequent application of a good lubricant during service is necessary to prevent the core becoming dry and absorbing moisture which will set up corrosion of the inner wires. A rather thick, semi-plastic compound applied while hot and in a thinned condition is perhaps the best lubricant.

Judging by Vibration
A useful device is the vibration recorder. Its chief function in life is to record vibrations chronologically by means of a pendulum-operated stylus. When installed on a production machine it writes an unfailing record of stops and starts. It should make a hit with the standards and time study department.

If you want to know how many hours a day or week a machine is busy it will tell you. Put it on a line conveyor-it will spot shut-downs, for repairs or other reasons. And some are on industrial trucks to check routing,

Fact and Fancy

Do milling cutters with inserted cemented tungsten carbide blades complicate tool grinding? Of course not, say experts who know. Proper cutter grinders plus intelligent care is all that's necessary .- J. G.



HOW'S BUSINESS ?

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HIRTY-FOUR ECONOMIC EX-PERTS-EDITORS OF BUSINESS PAPERS PUBLISHED BY THE United Business Publishers, Inc. -HERE PRESENT A COMBINED OPINION ABOUT THE COURSE OF BUSINESS DURING THE MONTH OF AUGUST. GOVERNMENT AND OTHER RECORDS PROVIDE YOU WITH HISTORY OF RECENT 'MONTHS. THIS BOARD OF EXPERTS DEALS ONLY WITH THE FUTURE. THEIR OPINIONS ARE BASED ON CLOSE CONTACT WITH THE MORE THAN 400,000 SUBSCRIBERS REACHED BY THEIR PUBLICATIONS IN FAR FLUNG FIELDS OF RETAILING AND INDUSTRY. ISTINGUISHABLE signs of the long heralded revival in business begin to grow more distinct. How much of the revival, other than further preparation, will take place during August is uncertain. Certainly the past few weeks have witnessed a material gain in favorable sentiment and, while it may be too soon to expect much in the way of visible returns from the moratorium, the leadership taken by this country has had a very salutary effect.

There is a distinct feeling, expressed in many quarters, that there will be an upturn this Fall, Similar seasonal expectations have been expressed during the past two years, but there seems to be more tangible encouragement at present. Consumer goods continue to flow in considerable volume, and

while the heavy industries are inclined to be rather sluggish, they are not without hope.

Commodity prices are moving in a somewhat more horizontal direction, with signs of strength in some items. This is indeed a hopeful sign that the long, demoralizing liquidation has been practically completed. While there may be further recessions over a long term period, temporary strength in commodity prices would go a long way in developing fortitude and crystallizing plans and purchases.

Labor Day, which falls on September 7th, gives another full week to what is nominally the Summer season. While a continuance of favorable signs may be expected during August, it is felt that with the turn into Fall, and particularly by the middle of September, improvement will be quite generally apparent.

THE COURSE OF BUSINESS FORECAST FOR AUGUST

BUSINESS	SALES	STOCKS	COLLECTIONS	COMMENTS
AUTOMOTIVE	Passenger cars 14% less, trucks 3% less, than July, and 4% and 5% less respectively than Aug., 1930.	Passenger car stocks slightly higher than July, trucks same. Both less than Aug., 1930.	About the same as July, and somewhat better than Aug., 1930.	Estimated sale of passenger cars in Aug., 203,000, trucks 32,000.
DEPARTMENT STORES	Increase of 5% over July (less than normal) and 10% decrease from Aug., 1930.	Increase of 5% over July, but 12% to 15% less than Aug., 1930.	No change from July or Aug., 1930.	At last the public appears to believe that prices are "right."
HARDWARE	Slightly less than July, and about on a par with Aug., 1930.	About 5% less than July, and 10% less than Aug., 1930.	Should show some im- provement over July, but somewhat slower than Aug., 1930.	Recent developments have imparted confidence to trade sentiment. Outlook for Fall brighter.
INSURANCE	Lower in life, better in casualty, even in fire as compared with July, and better in all lines as com- pared with Aug., 1930.		Slightly better in all lines over July, and over Aug., 1930.	Definite signs of a restoration of confidence in the immediate future are found in reports recently received.
JEWELRY	About the same as July, but generally less than Aug., 1930.	Much lower than July, and about the same or slightly less than Aug., 1930.	Slower than July, and sectionally better; same or slower than Aug., 1930.	August is normally a slow month in the jewel-ry trade.
MACHINERY METAL PRODUCTS METALS	Steel industry grows confident that July marked bottom of decline. Rate of improvement still highly speculative. Nonferrous markets continue unsettled.	Machine tool buying at low ebb, but sentiment for future considerably better. Equipment-buying programs show renewed interest, but orders are not as yet materializing.		Hope is the keynote of the situation, but there is little of definite char- acter on which to fore- cast.
PLUMBING AND HEATING	Plumbing same, or slight- ly better, heating about 5% increase over July, both lines much slower than Aug., 1930.	Little change in stocks from july, but lower than Aug., 1930.	No change in collections from July, or from Aug., 1930.	Interest in new goods and equipment by the trade is livening up.
SHOES	Equal to July at clear- ance prices, and nation- ally about 5% better than Aug., 1930.	Low point in Summer stocks will be reached. Stocks fresher than Aug., 1930.	Collections no longer a problem, sales the important thing. Average about same as Aug., 1930.	The outlook for August is most encouraging.

The FORUM

Some of the most stimulating automotive engineering discussions ever held have first appeared in print in The Forum. It's your space, engineers and executives, for the discussion of your own ideas. We reserve only the right to edit. The more challenging your letter, the more chance it has for publication. Brief letters are desirable, but excellence will usually merit space

Calculation of Engine Bearing Loads

Editor, AUTOMOTIVE INDUSTRIES:

I read with interest the article on "Bearing Loads" by R. N. Janeway in the recent issue of your magazine. This article gave a clear exposition of an analytical method of bearing analysis, but it contained some statements to which I desire to take exception.

I do not agree with Janeway that "there is no basis in the data available on lubrication for believing that an oil film can be maintained under pressure and temperature to which engine bearings are subjected." Mr. Janeway makes this deduction from the work of Tower, which was conducted in 1885. Since that time considerable further knowledge has been obtained on bearing lu-The statement that with brication. film lubrication the coefficient of friction always varies inversely with pressure is erroneous. It has been shown that with film lubrication the coefficient of friction of a given bear-ing depends upon the pressure divided by the product of journal speed and absolute viscosity of the lubricant. With constant speed and viscosity, the coefficient of friction decreases with increase of pressure, but the rate of decrease diminishes as the maximum load-carrying capacity of the film is Near the point of rupture of the oil film, the variation of coefficient of friction with pressure is small. The load necessary to rupture the oil film depends upon the journal speed and the viscosity of the oil. A bearing can readily be constructed to support 1500 lb. per sq. in. of projected bearing area provided the peripheral velocity of the journal is sufficiently high and an adequate supply of lubricant is properly introduced.

Film lubrication is obtained when the bearing and journal are completely separated by an oil film, so that the friction generated at the bearing depends upon the viscosity of the lubricant and not upon the materials of the journal and bearing. Film lubrication is characterized by a low value of the coefficient of friction and by the fact that the heat of friction is generated in the oil. With film lubrication, the coefficient of friction can be as low as .002. Without film lubrication, the value of the coefficient of friction would be much higher. In a high-speed engine it is desirable to maintain film lubrication in order that the friction losses in the engine and the heat generated at the bearing will not be excessive.

Mr. Janeway states that abrasion is always evident in engine-bearing surfaces, which shows that film lubrication is not maintained. seen numerous aircraft engine bearings which were run at sustained high speed under high unit loadings which showed no evidence of abrasion or wear. The oil film under heavy load is very thin. The smallest particles of dirt in the oil break through the film and may cause bearing abrasion. Under sustained high speed operation, bearing abrasion can only be eliminated by keeping the lubricant free from all dirt particles.

Mr. Janeway is evidently not familiar with the advances made in bearing construction in aircraft engines when he states that "it is evident from these considerations that the product of velocity and pressure (PV) is the factor which largely determines bearing life." The modern aircraft engines have considerably greater bearing life than the engines built five years ago and they also operate with much higher PV factors. It is unwise to make any definite statement on the safe limit of PV factor. Before the advent of the automobile engine, the Engineers' Handbooks advanced a maximum safe value of PV factor of 6000. Mr. Janeway states that a PV of 20,000 is desirable and 30,000 is possible. In modern aircraft engines, PV factors of 45,000 are not Unlike the automobile uncommon. engine, the aircraft engine must operate continuously at a high PV factor without sacrificing reliability.

I agree wth Mr. Janeway that a bearing analysis is always desirable when designing a modern engine. It is uneconomical to design for high loads and PV factors when these are low, while it is ruinous to neglect to design for them when they are high. However, I do not agree that it is also essential to place definite limits on load-carrying capacity or PV factor. Improvements in bearing design and materials will always raise the allowable safe limits.

The analytical method of analysis advanced by Mr. Janeway may save a little time in determining the PV factor. I believe, however, that it is betto construct the usual polar diagrams when making the bearing analysis. The diagrammatic method The diagrammatic method avoids the dangers of errors in multiplication and addition which cannot be readily detected in an analytical analysis. The polar diagrams also show the variation in magnitude and in direction of the forces acting on the bearing, which information is necessary for a complete analysis. My experience with aircraft engine bearings has shown that the capacity of a bearing is determined not only by the magnitude of the forces acting on the bearing, but also by how the direction of the forces varies throughout the cycle.

HAROLD CAMINEZ.

(The foregoing letter was submitted to Mr. Janeway, whose reply follows.—Editor.)

It is quite apparent from Mr. Caminez's letter that he never got beyond the introduction to the article in question. I base this conclusion, first, on the fact that all but a single paragraph in his communication of approximately one thousand words is directed at statements made in the introduction; secondly, on his obvious failure to understand the method of determining bearing loads, which formed the subject matter of the article.

Mr. Caminez gives himself away in the last paragraph of his letter, in which he dismisses the method presented as inadequate on the grounds that it defines merely the magnitude and not the direction of the bearing loads. Even superficial examination of the sample charts given in the article should be sufficient for a man of Mr. Caminez's knowledge and experience to realize that the direction of the mean resultant load for any crank-angle period and for any bearing is readily obtained from the given magnitude and direction of the vertical and horizontal components. It will be noted in the tabulation of each independent vertical and horizontal force acting on the crankpin for each crank-angle period that the proper sign is indicated, the vertical force being taken as positive in the direction toward the piston; the horizontal force being taken as positive in the direction of rotation at top dead cen-The summation of the various simultaneous forces thus yields either a positive or a negative quantity, which defines both magnitude and direction of the net force. While the mean load on any bearing taken over the whole cycle is merely an arithmetical average of all the individual resultants and has no direction, the charts automatically supply all the information required to determine the direction of the mean resultant load acting on any bearing during any crank-angle period. The mean polar diagram for each bearing may thus be readily constructed with very little additional effort.

Mr. Caminez's only other criticism of the method is that it involves greater possibilities of undetected error as compared with the usual graphical method, because of the required addition, subtraction and multiplication. Mr. Caminez must admit that an accurate graphical determination requires, first of all, a man of considerable experience in such work; and, furthermore, that he be a very precise draftsman to avoid the cumulative errors which tend to build up in any graphical analysis. Compared with these requirements, the cut-anddried arithmetical operations called for in the method presented in the article should be well within the capabilities of a competent grocery clerk, let alone of any man likely to be assigned the simplest job of design computation. With regard to the relative time required by the two methods, if Mr. Caminez means by a "little time" saved, anywhere from ten days to two weeks, I agree with him.

I should like to point out again that Mr. Caminez's actual criticism of the subject matter of the article is confined to a short paragraph concluding his letter. The body of his letter is devoted to a discussion of fluid film lubrication and bearing PV's which corroborates, rather than disputes, the major premise of the introduction to my article, namely, that the coefficient of journal friction is practically independent of load in the critical range of operating conditions, so that bearing friction tends to increase in proportion to load in this range. While this premise is fundamental to

the use of the PV factor, even as a rough criterion of bearing work, it appears to contradict the principles of fluid film lubrication. Mr. Caminez is evidently unaware of this contradiction, since he naively involves himself in it when he says, "It has been shown that with film lubrication the coefficient of friction of a given bearing depends upon the pressure divided by the product of journal speed and absolute viscosity of the lubricant," and then, "Near the point of rupture of the oil film the variation of coefficient of friction with pressure is small." Since the coefficient of friction cannot be independent of pressure and at the same time depend upon the pressure as characteristic of perfect film lubrication, we must conclude either that perfect film lubrication no longer obtains in the critical high-pressure range, or that the theoretical deductions underlying the criterion for film lubrication are based upon false assumptions.

Regardless of whether perfect film lubrication is maintained during the critical range of operation, practically all the available data show the tendency for the coefficient of friction to remain virtually constant over a considerable range of pressure preceding failure, as Mr. Caminez agrees. The Tower experiments were quoted merely to illustrate this tendency. Although this work dates back to 1885, it is no less valid but rather all the more authoritative because the "considerable further knowledge," to which Mr. Caminez refers, representing the accumulation of more than 40 years,

still bears out the point in question.

Mr. Caminez is inclined to "fly off the handle" in condemning the statement that the PV factor largely determines bearing life. It was clearly brought out that the PV factor in itself could be only a measure of heat generation and, therefore, of the tendency of the bearing and oil temperature to rise. The resulting temperature of a given bearing is obviously also a function of the efficiency of heat dissipation from the bearing and from the oil. The limiting safe value of PV is. therefore, subject to all variables affecting heat transfer as well as the limitations of the materials themselves. For a given set of conditions, however, the PV factor should still govern the operating temperature and, hence, the bearing life.

Certainly it would be foolhardy to attempt to apply any PV limitations determined on automotive engines to the entirely different conditions obtaining in aircraft practice. It was deplored in the article that no fundamental data are available for defining limiting PV values, and that questionable empirical values must be resorted This apology accompanied the values mentioned, which were quoted as being representative of the present state of the art in the automotive field without supplementary oil cooling. Actually there is no limit to the possible PV if the heat generated in the bearing can be dissipated without exceeding the safe operating temperatures of the oil and bearing.

ROBERT N. JANEWAY.

Are Diesel Engineers Too Close to Gasoline Engines?

Editor, AUTOMOTIVE INDUSTRIES:

Ten years ago a man who predicted that the compressor would disappear in Diesel-engine practice and that engineers would favor the pre-combustion or similar principles was pretty sure to hit the nail on the head. Today it is just as easy to predict that the compression ratio will be increased considerably, and that the trend in cylinder head design will be away from the ante-chamber and toward direct injection into the cylinder. There is still much talk—too much talk, I think-about the terrible combustion pressure, which is supposed to wear out the bearings, pistons and cylinder walls very rapidly; which increases the weight per horsepower, and which makes it very difficult to produce the engines at reasonable cost. But everybody should keep in mind that yesterday's machine is inefficient in comparison with the modern one, and that it will require hard work to produce a still better machine for toOne expression often used in discussions of automotive oil engines is "the unbelievably short time available for injecting, distributing, heating and burning the oil fuel." Now, in my opinion 0.001 second to an engineer does not mean much more than 0.0001 inch to the modern shop man. The only difference is that it is not so easy to measure 0.001 second accurately, but there is no question that it is just as possible to direct a process of 0.001 second's duration as it is to manufacture steel balls within limits a few ten-thousandths inch apart.

I have the feeling that many engineers working on Diesel engines are too closely connected with gasoline engines. When they think of an oil engine they seem to see only a fourcycle overhead-valve engine, and they emphasize its superiority without proving the inferiority of other systems. It is no proof of the inferiority of the system if the owner of a small shop builds a new engine and fails to

carry his experiments to a successful conclusion for lack of scientific engineering, good design, money or salesmanship. The worth of the engine can be judged only after extended tests in well-equipped and well-managed laboratories and proving grounds. I am pretty sure that a man who had offered here a design similar to the Junkers Diesel, at a date before this engine met with success, would not have done a profitable business. Every engineer would have told him that the upper piston was much too heavy, that the rubbing speed of the center main bearings was too high, that the crank mechanism was too complicated, etc., and yet this is one of the most successful high-speed Diesels.

It is often overlooked that the fundamental principles of gasoline and Diesel engines differ in some ways, and that probably different means must be resorted to in order to develop the most economical design of each type. Take the air intake, for instance. In the gasoline engine the fuel and air are mixed before entering the cylinders, while the Diesel draws in only pure air. It is largely due to this fact that the two-stroke cycle is not a success as applied to gasoline engine, but offers some very attractive features in connection with

oil engines. By scavenging with an excess of air the exhaust gases can be swept from the cylinders almost completely, the cylinder and piston walls cooled where they are hottest, and greater freedom in the design of the combustion chamber obtained. Whether the air should be supplied by a blower, a rotary compressor or a piston compressor is an open question, none of these three types having been definitely shown to be inefficient. Their reliabilities depend chiefly on the design and on the ingenuity and the amount of money spent in their development.

Another type which deserves much attention is the sleeve-valve engine. It gives still more freedom with respect to cylinder-head design and permits of very desirable forms of inlet and outlet ports. Do not think that I specially advocate these two systems. I merely picked them out from among the possibilities which cannot all be mentioned in a brief article.

Finally I wish to express my surprise at the almost complete absence of research publications in America. With the exception of Langley Field, Pennsylvania State College, and a few others, there seems to be nobody who is helping the development of the Diesel engine by publishing his re-

search work in such a manner that other engineers may use the infor-mation as a basis for further develop-What I consider a complete ment. publication is one which gives details about the apparatus used, to enable one to judge the value of the data; which gives all of the important data, or at least large and accurate diagrams, and in which the author states his opinion regarding the results obtained. On first consideration it would seem that such a procedure would hurt the interests of individuals, but it is a fact that it sped the development of Diesel engines in Germany. Such publications help to avoid useless repetition of effort, and they direct attention to new problems; they enable the engineer to check his results with those of others; and, finally they give us a deeper understanding of the problems involved in the design.

Owing to reasons connected more with the working of the human mind than with economics it is not very likely that companies engaged in this line will publish data that are very useful to the engineer, but much might be expected from colleges and large engine purchasers, such as the Navy, Army, airplane manufacturers and large bus and truck companies.

F. A. EYSN.

Wisconsin Air-Cooled Engines for Industrial Needs

WISCONSIN MOTOR CO., Milwaukee, Wis., has entered the field of small industrial engines by bringing out a series of air-cooled engines ranging in output from $1\frac{1}{2}$ to 5 hp. The engines are intended for such equipment as sprayers, conveyors, mixers, saw rigs, pumps, compressors, lighting plants, garden cultivators, garden tractors, road machinery, fruit dusters, potato diggers, blowers, grinding machinery, snow plows and shearing machinery.

All of the engines are of the single-cylinder vertical type. Following are the chief specifications of the different models:

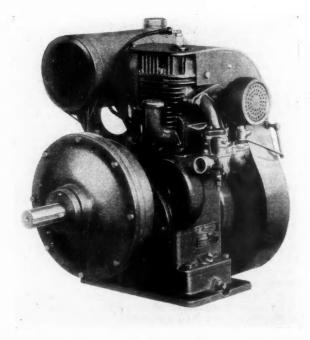
Model	A-11/2	A-2*	A-3	A-4	A-5
Bore	23/4	3	31/4	31/2	31/2
Stroke	31/4	31/4	4	4	4
Speed	1200	1200	1200	1200	1300
Hp.	1 1/2	2	3	4	5
Int. Valve	†15/16	15/16	17/16	17/16	19/16
Exh. Valve	15/16	15/16	19/16	19/16	19/16
Spark Pl.	Metr.	Metr.	Metr.	Metr.	Metr.
Cyl. Head	C.I.	C.I.	C.I.	C.I.	A1.
Net Weight	125	130	165	170	170

*Models A-2, A-3 and A-4 can also be operated at 1300 r.p.m. and are then known as models A-2½, A-3½ and A-4½ respectively.
† Outside diameter.

All models are of the L-head type. Ignition is by a flywheel type of magneto. A large fan cast in the flywheel supplies a blast of air which is forced across and around the cylinder and head. A housing controls the air flow. Lubrication is by an oil pump in the engine base, which is driven from the camshaft. All engines turn clockwise, looked at from the flywheel

end. There is an air governor at the top of the hood. Crankshafts are mounted in two Timken roller bearings.

Various articles of equipment, such as clutches, air cleaners, pulleys, reduction drives and sprockets can be furnished with these engines.



Rubber Research Opens New Possibilities in Design and Comfort of Car Upholstery

British Association conducts competition to develop ideas for increased use of rubber in automobiles + + + + + + +

UGGESTIONS concerning the use of rubber in automobile upholstery have come particularly from England, where the Rubber Growers Association of Great Britain has been conducting a "new uses competition" in connection with which particular encouragement has been given to new applications of rubber for upholstery purposes. Particulars of some of the developments along this line are given in the Bulletin of the Rubber Growers Association for March last.

The earliest form of rubber upholstery consisted of an ordinary rubber air bag cushion. While it served a useful purpose it had the defect of proneness to side roll, and in view of later developments this type may now be regarded as obsolete. Recent research has been directed mainly to overcoming this defect, and the problem may be said to have been solved by at least two different types of pneumatic cushion which are now finding increased application.

The first consists of a tube or tubes specially arranged and constructed so that they lie in folds within an outer cover. These folds run from front to back and provide a buoyant, comfortable seat. The weight carried is borne evenly by the tubes in that particular portion of the cushion, and complete support is given with surprisingly low interior air pressure.

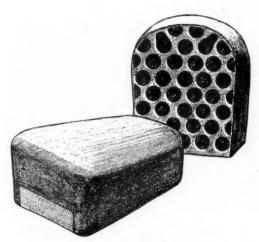
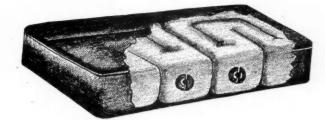


Fig. 2 — Honeycomb type of sponge rubber construction for upholstery materials prevents sagging



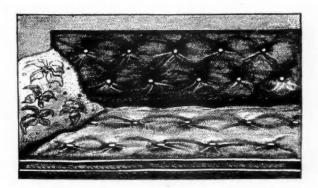


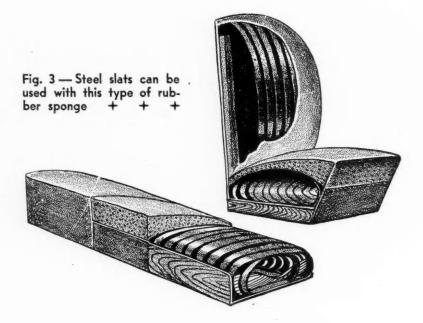
Fig. 1a — Design possibilities unlimited with "newmatik" sponge-stuffed cushion, which may serve as mattress at night + + +

The second type consists of a rubber bag filled with air and containing rubber pillars placed at intervals. These pillars, which are hollow, are open at each end and enable the cushion to keep its shape when a weight is placed upon it. They eliminate the rolling referred to in connection with the ordinary old-fashioned pneumatic cushion.

Side by side with this development of pneumatic upholstery, recent years have witnessed the adoption of sponge rubber for this purpose. The resiliency of this material makes it react to every pressure and therefore makes it well suited for upholstery purposes.

The major prize in the "new uses competition" organized by the Rubber Growers Association and referred to early in this article was in fact awarded for sponge rubber upholstery. As compared with pneumatic upholstery, cushions filled with sponge rubber are unpuncturable, and do not require inflating. It is claimed for them that they remain permanently soft and resilient and cannot become hard or lumpy. Three different types of sponge-rubber upholstery are now on the market in England.

The first involves the use of sponge-rubber clippings and relies entirely on the sponge rubber for resilience.



It has the advantage of being easily and cheaply manufactured. Alternately, plain sheets of sponge rubber of the requisite thickness have been utilized, and have enjoyed a certain measure of popularity.

A later development differing from the other types involves the substitution of strips and sheets of sponge rubber for the usual springs and/or hair, built up into tiers, to give maximum comfort and resiliency. A thin layer of wool or hair is added at top or bottom of the cushion, and the whole is inclosed in the usual tick or cover, which is provided with a number of air vents at the sides and ends. The result is a cushion which in appearances is quite similar to the ordinary spring-and-hair cushion, and for which several advantages over the latter type are claimed.

Latex Sponge Developed

Recently there has been developed yet another form of sponge upholstery, the sponge for this being made directly from latex. The essentials of the process for the production of latex sponge rubber are that a latex mixing is whipped into a froth, the froth poured into molds, allowed to set, vulcanized, and removed from the mold and dried. The mixing used may be made either from concentrated compounded latex or concentrated latex obtained by centrifuging, the latter being preferable for low densities. The mixture is aerated by a patented procedure, and the resultant mobile froth is then poured into suitable molds, wherein it sets a few minutes after pouring, a setting agent having been added just before the end of frothing.

The mold is put immediately into the vulcanizing pan and the vulcanizing carried out. The wet sponge rubber article is then stripped and finally dried. The setting of a mobile froth of the type described permits the easy molding of most complicated shapes in relatively inexpensive molds. Articles such as car seats, which by the ordinary methods necessitate an expensive built-up construction, may be molded in one piece as easily as a plain slab.

This molding in one piece permits the use of vertical cavities, which construction allows a minimum amount of rubber to be used for a given load-carrying capacity. The provision of vertical cavities is said to also insure

enhanced comfort and cushioning effect.

A very important feature of this latex process is that articles can be easily made jointless but of graded properties. In upholstery the base or bottom portion can be constructed from a relatively dense sponge rubber, the upper or surface portion being of a light and soft rubber. This is achieved by partially filling the mold with one froth, allowing it to set, and completing the filling with the second froth of a different nature. These froths unite so they are inseparable. Sponge rubber articles may be made also in layers of different colors.

A number of special advantages are claimed for this latex sponge rubber: The use in it of ultra accelerators gives rise to a harder rubber which again permits a reduction in weight for the same load-carrying capacity. Latex sponge rubber has an abnormal

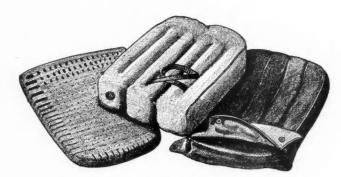


Fig. 4—Interlaced rubber base which can be used with air cushion + + + + +

liveliness and recovery, owing to the fact that it has undergone no mastication or treatment that will impair its original nerve, and to the use of accelerators normally prohibited. It gives the maximum degree of shock absorption and insures a maximum comfort, due to its superior elastic properties and to the ability to obtain a fine pore structure. There is an absence of crust in this type of rubber, as no inflation takes place during cure, the structure being set before cure. There is only a superficial skin to the sponge rubber.

Apart from complete rubber units, manufacturers interested in other forms of seating have investigated the possibility of combining rubber with other materials.

Recently there has been developed an interesting type of car seat which represents a radical departure from the chief methods of construction (coil springs and pneumatic). The seat and back squab are built up from tempered chromium steel spring slats shaped to find the right degree of comfort and resilience. An improved form of this seat is provided with a shaped layer of sponge rubber over the steel slats, as illustrated. This combination dispenses with all other stuffing material, is clean and hygienic, and will retain its shape for a number of years. Trimming is done away with, the sponge rubber being simply secured to

the spring frame, nothing else being required but the final material in the form of a loose cover.

A new form of seating with a rubber base has been developed by consultants of the Rubber Growers Association, and it is proposed to use either a diaphragm consisting of a plain sheet of rubber stretched across a frame, or interlaced strips of rubber, as shown in the accompanying illustration. On the diaphragm there can be mounted either a padded type of cushion or one of the existing types of air bag, sponge rubber, or latex-treated hair. In any case, it is claimed, the shock-absorbing qualities are greatly improved and comfort is increased, as the diaphragm "gives" just

sufficiently to absorb minor shocks and prevent any possibility of "bottoming" when the car traverses a bad road.

The rubber diaphragm when loaded assumes a hammock-like formation, and when used in conjunction with air bags, minimizes any lateral or fore-and-aft displacement or rolling tendency.

Latex-treated hair, to which reference has been made, is another development in the use of rubber for upholstery purposes. This type is said to be very buoyant, light and hygienic, and unlike ordinary hair cushions, to retain its resilience and not to become lumpy and sag.

Vast Area of China Hardly Scratched by Its 39,938 Miles of Improved Roads

(Continued from page 127)

The commission divided national highways into two definite classes: China proper lines and frontier defense lines. The latter were selected solely from the viewpoint of national defense and the former were designed to connect the different provincial capitals with Nanking.

"The plans call for the supervision by the Ministry of Railways of the construction of 22,518 miles of national highways over a period of 20 years.

"Preliminary conference estimates indicated that the lines in China proper could be completed with earth roads for approximately \$70,000,000 silver. A substantial portion of the lines in China proper have already been opened to traffic, as they consist of highway construction formerly begun in different provinces."

Under certain definite limitation private labor is being conscripted for work on these highways and one regulation provides that "in case any person refuses to work on the highways, payment of twice the amount of wage for a hired laborer for this portion of the work shall be imposed . . ."

The intimate manner in which this whole roadbuilding and motor transport problem is being tied up with and by governmental authorities in China is further illustrated by the six major regulations governing motor transportation on national highways which are a part of the law:

1. All motor transportation in China shall be controlled by the various provincial boards of construction under the supervision of the Minister of Railways.

2. Private transportation companies may be organized but must be registered at the provincial road bureaus under the provincial boards of construction.

3. All transportation companies and organizations must render periodical reports on operating conditions to the Government organs in charge of national highways in their district or province for inspection.

4. All transportation companies must pay rental for the usage of the public highways.

5. All transportation companies and organizations must maintain automobile servicing and repair plants.

6. When all national highways are completed, joint transportation services shall be rendered under the through traffic policy of the government.

And all that's a little different from the way Uncle Sam does it, too!

Now there really isn't any more to this little story

about Chinese road development, unless you have become interested enough in the background of the narrative to want to stay a moment longer and listen to Miss Smith's description of what probably was the first odometer ever developed.

first odometer ever developed.

"Early Chinese legend," Miss Smith narrates, "says that the immediate descendants of the first man lived in trees and had no use for roads. However, as time went on and their sphere of activity enlarged, travel was for the most part by natural waterways. Penetration of the country was first by trail, followed by the establishment of paths which later became highways.

"Huang Ti, one of China's first three known rulers who lived back about 2688 B.C., is said to be the first person in China who measured the roads, for according to San Hai Ching, this early ruler measured the distance that he traveled during his cross-country inspection tours by means of a wooden figure attached to a wheel of his chariot which automatically beat a drum once at the end of every li (one-third of a mile) of road over which the wheel had rolled a certain number of times. He then marked the distance of the road by piles of earth or stone.

"The ascertaining of directions and the measurements of distances were two essentials to traveling before men resorted to other transportation and communication facilities on land or by water."

T is to be expected that the development work now being done on high-speed Diesel engines will result not only in the extensive use of that type of engine for automotive purposes, particularly in the heavy-duty lines, but also in the increased use of oil engines in small stationary plants. In such plants, since there are no such severe restrictions on weight, the engines can be built with a relatively small number of cylinders, and hence cheaper, and the saving in fuel and the elimination of fire risks are at least nearly if not quite as important as in vehicular service. At the recent Leipzig spring fair, two such small industrial Diesels were shown, one a single-cylinder, two-stroke, direct-injection DKW of about 4 by 5 in. bore and stroke, weighing 320 lb., the other a 6-hp., four-stroke, precombustion-chamber-type Deutz, which sells at

Fuel Spray Observation Apparatus

CLERGET in a note to the French Academy of Sciences describes an apparatus for observing fuel sprays. It consists of a vessel made of steel of high tensility, provided with quartz windows of sufficient size for observation. A luminous source permits of observing the jet either by transparence, by reflection, or by illumination in the direction of the axis, according to the position occupied by it.

A conical tuyere, provided on the inside with directing means, supplies the vessel with compressed air, being in permanent communication with a compressor,

which assures a steady supply.

The lower end of the vessel terminates in a converging tuyere provided with a valve which is lifted in synchronism with the injection mechanism. The lift of this valve is variable and adjustable in operation by means of a variable cam. The operation of the apparatus is as follows:

At the speed selected for the observation and a given rate of injection, the lift of the valve is so adjusted as to assure a complete evacuation of each injection. A manometer (pressure indicator) indicates the variations of pressure and the pressure at the moment of injection.

A suitable adjustment gives a minimum of turbulence in the air when being renewed, and in this manner images of great clearness are obtained. By direct observation the whole of the phenomenon may be observed, including the volume of the jet and variations in the penetration with the air pressure.

This apparatus lends itself particularly well to stroboscopic observations and to synchronized highspeed photography. By means of the Stroborama it was found possible to obtain photographs under favorPhotography permits determination of velocity of fuel injection in heavy oil powerplants + + + + + + +

able conditions, and the addition of a powerful condenser made it possible to obtain pictures with an exposure of one-millionth of a second. These photos brought out the effects of elasticity of the fuel piping, of spring compensation, and of inertia of the fuel column. Photographs taken in very rapid succession permitted of determining the velocity of penetration of the jet. Simultaneous illumination of a graduated disk mounted on the pump shaft indicated the angular duration of the injection and the phase difference between the mechanical part and the position of the jet observed.

On the Clerget heavy-oil engine, with an injector having a single orifice, closed by a needle valve which lifts automatically under the pressure of injection, at

a speed of rotation of 1040 r.p.m.

1. The total duration of injection is 1/360 second; the mean velocity of penetration of the jet was 425 ft. per second when injecting into air at atmospheric pressure and 106 ft. per second when injecting into air compressed to 28 atmospheres, under an injection pressure of 3000 lb. p. sq. in.

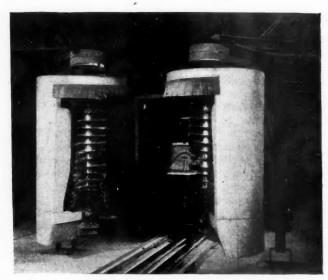
2. By drawing a curve through the summits of the jets of five successive images during the period of development of the jet, it is found that this curve is essentially a derivative of the profile of the cam oper-

ating the injection pump.

Dry-Cleaning Automobile Bodies

NE of the most significant developments in body finishing is the recent introduction of the "dry cleaning system" and the power-driven brush equipment for removing the products of the cleaning operation preceding the undercoating operation. This method was developed by several prominent automobile manufacturers in cooperation with the American Chemical Paint Co., manufacturers of Deoxidene No. 202 for operations where very little rust is encountered.

After the body is coated with deoxidene or other commercial dry cleaning agent, it passes through the drying oven and upon emerging is pulled through on a conveyor between the two brushes shown. These brushes are designed to hug the contour of the body, being made up of separate sections of varying diameters and angularity with respect to the vertical axis. On a typical sedan body, the brushes will thoroughly clean both sides from the cowl to the back panel, thus leaving only the front of the body, the back and corners, for detail hand work. We are told that this equipment has been installed in several large body finishing plants with a marked reduction in cost, as well as an increase in production rate.



After the body is coated with some dry cleaning agent it is put into an oven and emerges between the brushes as shown

Campbell Synchronizing Transmission Uses Helical Gears for Silence

A TRANSMISSION for automobiles in which helical gears are used to assure silent operation and in which synchronizing of engaging gears is effected by frictional means before they are positively engaged, has been patented by L. J. Campbell, who will be remembered by many in the automobile industry as the inventor of the traffic transmission. It is being manufactured by Hand's Constant-Mesh Transmission Co. of Chicago.

The Campbell transmission uses the ordinary H shift and contains individual synchronizing clutches which operate on silent helical gears. The gears for the low forward speed and the reverse are of the usual stub-tooth type and are shifted the same as in the conventional sliding gear transmission. The synchronizing clutches differ in the means of internal operation only, and are shifted the same as sliding gears, so far as the operator is concerned. The sliding gears are mounted directly on the splined shaft, which makes it possible to maintain the same tolerances as have been customary in conventional transmissions.

The synchronizing clutches are made up of three

units, as follows:

1. The carrier, which carries the conical-cup shaped bronze clutch and is fastened to the gear;

2. A conical-shaped coupling which is splined to the shaft and rests on an internal ring, which is broached to engage

the teeth of the clutch; and

3. The male portion of the clutch, which carries the internal ring and is broached to fit the splined shaft and the main shaft. This ring, which is loosely mounted in the conical-shaped piece and is held in position by a lock ring, is the means of making the permanent coupling. It is operated by means of a pivoted cam which is located in the housing of the shift lever. The cam is operated by the shift lever with a greater leverage than that used in operating the sliding gears. It is engaged and disengaged in the usual manner; that is, the same as if it were an ordinary sliding gear.

A standard fork is used to connect the clutch member bearing the positive connecting internal ring, so when the lever is operated in the usual manner the cam first causes the cone clutch to engage by a forward movement, which synchronizes the gear. By the aid of a spring plunger the slack of the cam is taken up. The angle of the cone synchronizing clutch is greater than used in any other synchronizing mechanism, which is said to assure positive synchronization. Use of such a large angle is possible in this cam-operated clutch without sticking because the clutch is positively separated before the positive connection is made, which eliminates the drag of the synchronizing clutch on the positive clutch mechanism when lining up the tooth members of the positive clutch.

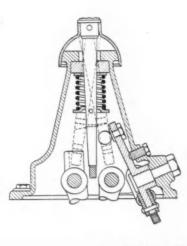
The main splined shaft has a shoulder for the positive clutch to rest against, which prevents creeping of the positive clutching ring and prevents disengagement. The positive clutch is splined and carried on the hub of the second-speed gear, which gives this

gear an additional bearing support which reduces misalignment when positively clutched. The positive clutches are small in diameter, which reduces their peripheral speed and insures long life to the engaging parts.

The placing of the second speed gear at the rear bearing gives additional advantages in connecting the splined shaft, as it has only one set of splines to be formed and relieves the sudden pressure caused by quick step-back on the pilot bearing.

Above—Longitudinal section through Campbell synchronizing transmission

At right—Shift gear of Campbell transmission, showing how one shifter bar is engaged by the shifter lever directly and the other through the intermediary of a cam disk + +



Automotive Oddities-By Pete Keenan







OF THE INDUSTRY

General Motors Income Up 3.3%

Second Quarter Net is \$1.22 a Share, 5c Gain

NEW YORK, July 22 — Net earnings of the General Motors Corp. for the three months ended June 30, 1931, including equities in the undivided profits or the losses of subsidiary and affiliated companies not consolidated, were \$55,122,767. After deducting dividends of \$2,343,-970 on the preferred stock, there remains \$52,778,797, or the equivalent of \$1.22 per share, earned on the common stock outstanding.

This compares with operating earnings of \$53,386,768 for the second quarter last year, which, after deductions for preferred dividends, left \$50,976,626 available for the common stock, or the equivalent of \$1.17 per share. However, these latter figures do not include a nonoperating, non-recurring profit of \$9,517,943 resulting from the sale to General Motors Management Corp. of 1,375,000 shares of common stock of the General Motors Corp. Thus total earnings for the second quarter last year, operating and non-operating. were \$60,963,841, or the equivalent of \$1.34 per share, on the total common stock outstanding.

Net earnings for the six months ended June 30, 1931, were \$84,122,176, or the equivalent, after the deduction of \$4,687,539 for dividends on the (Turn to page 143, please)

Eaton Quits Sheet & Tube

YOUNGSTOWN, OHIO, July 20-Cyrus S. Eaton of Cleveland resigned today as a director and member of the executive committee of the Youngstown Sheet & Tube Co.

Mr. Eaton is still a director of the Inland Steel Co., Chicago, and the Republic Steel Corp., Youngstown.

SEVERAL short years ago a gangling lad from the West had a tough time getting an engine and plane for a transatlantic hop. For a long time no company was willing to chance its reputation. Wonder how many companies today covet Lockheed for supplying the Lindbergh plane which may wing way westward across the Pacific next week? * And, speaking of adventure, far out in the remote passes of Kashmir, where the heavens consort with trackless mountain peaks, natives are as amazed at the motor caravan as are members of the Citroen-Hardt expedition at the wonders of nature. It's no news to most of us, but a survey made in Gotham reveals that college-trained engineers, chemists and other technicians start at lower wages than do truck drivers. * * * It is rumored around Detroit that W. C. Cowling, veteran Ford executive and at present traffic manager, will soon be known as general sales manager of the company. Ford officials "neither confirm or deny" although it is understood he has been active in sales work for some time. * * * No one has had the Ford S. M. title since F. L. Rockelman left to become president of Plymouth. * * * Automotive Oddities, July 18, showed the venerable Shun, "Son of Heaven" and Chinese emperor of 2258 B. C., seated in his flying machine with a member of the imperial household as mechanic, pilot or whatever title such a one carried those days. Pete Keenan, prolific staff artist, has been receiving letters asking "howcome?" Our sources: Confucius (Anecdotes of Time, Shu Ching, Bamboo Books, etc.), and referred to in "World in Air," Putnam's, 1930. Chinese literature and art are the most reliable records extant of those dim days. This fact is thus recorded in literature and on tapestries mildewed and fragile with age. Automobile production continues downward, but at a rate less than the usual seasonal decline.

Factory shutdowns will accelerate this drop. * * * L. P.

THE **NEWS** TRAILER

Expects 3.7% Rise in Gasoline

A.P.I. Estimate for Last Half is Over 1930 Figure

NEW YORK, July 24-Demand for American gasoline, domestic and foreign, in the last half of 1931 will be about 3.7 per cent greater than it was in the same period of last year, says the American Petroleum Institute. It was said that 27,184,000 bbl.

of gasoline at refineries on Oct. 1 would provide ample working stocks. Contemplating an increase of 3,100,000 bbl. above working stocks between Oct. 1 and Dec. 31, the committee set 30,284,000 bbl. as the economic limit for such gasoline stocks at

the end of the year.

For the last half of the year the committee estimated a decline of 2.4 per cent in the total demand for crude oil, but said it looked for a 6 per cent in-crease in exports. Domestic crude oil requirements for the period were placed at an average of 2,393,000 bbl. daily.

In its summary the report estimated the total demand for gasoline at 241,200,000 bbl. in the last half of 1931, compared with 232,500,000 bbl. in the last half of 1930

The total demand for gas and fuel oil was placed at 134,600,-000 bbl., against 139,800,000 bbl., and total demand for crude oil at 466,500,000 bbl., compared with 477,800,000 bbl. in the last half of 1930.

Czecho Plants Merge

PHILADELPHIA, July 25-A merger has been effected between the three largest Czecho-Slovakian automobile factories, the Tatra Works, the Praga Works and the Asap Works, the latter the automobile subsidiary of the Skoda Works.

It is planned to increase the production of passenger cars in Czecho-Slovakia, which amounted to 13,000 in 1930, to 20,000 per year. A saving of 100 million crowns (about \$3,000,000) is expected to result from the merger, and it is planned to make a stronger bid for export business in the future.

Motor Products Profit 84c

DETROIT, July 22 - Motor Products second quarter net profit was \$164,434 after interest, depreciation, etc., or 84 cents per share compared with \$370,220 or \$1.37 for the same quarter last year. The net profit for six months this year was \$257,121 or \$1.31 per share against \$602,239 or \$3.05 per share for the same period last

Men of the Industry and What They Are Doing

Kublin is Auburn Chief Engineer

Announcement was made by Herbert C. Snow, vice-president in charge of engineering of the Auburn Automobile Co., of the appointment of George H. Kublin as chief engineer for the company.

Mr. Kublin has been associated with Auburn for three years where he held the position of assistant chief engineer. He has had a wide experience in the industry, covering a period of seventeen years.

Heminway Organizes Firm

Montie L. Heminway, formerly managing director of Motor & Equipment Association and president of American Trade Association Executives, has organized a firm of trade association management advisors, and representatives of selected hotels. Harry B. Dickson, a veteran in hotel association work, is the other member of the organization, Heminway & Dickson, Inc.

Hargis With Marathon

W. W. Hargis has been appointed special representative of the sales promotion department for Dodge Brothers Corp. to accompany the Dodge Eight Mileage Marathon Car during its second year of cross-country travel, according to an announcement by K. A. Ridenour, director of sales promotion.

In accompanying the Marathon Car, Mr. Hargis will assist Dodge dealers in working it into their local sales programs.

Rickenbacker is Referee

Col. Edward V. Rickenbacker, America's ranking ace in the world war, has been named referee of the 1931 National Air Races, Cleveland Airport, Aug. 29 to Sept. 7.

Appointment of Rickenbacker will bring to the races a chief arbiter who has long been a colorful figure in aeronautics. He is now vice-president, director of sales, for the Fokker Aircraft Corp.

De Paolo Rejoins De Soto

Peter De Paolo has rejoined the sales staff of De Soto Motor Corp., according to an announcement by L. G. Peed, general sales manager.

At the beginning of the present racing season De Paolo was granted a leave of absence in order to participate himself and to supervise the entry of his racing cars in the various AAA races throughout the country.



George H. Kublin

Sails for Europe to Install Welder

M. L. Eckman, development engineer for Federal Machine & Welder Co., Warren, Ohio, has left for Europe where he will install the largest rear axle housing welder ever shipped to Italy. The company has sold a number of pieces of equipment in France, England and Germany. He will assist in training operators in the plants of Renault, Citroen, Fiat, Fried-Krupp and others.

Westinghouse Promotes

Appointment of T. J. Pace, assistant to vice-president, in charge of general market planning and research analysis; M. B. Lambert, sales manager in charge of transportation department; O. F. Stroman, sales manager in charge of industrial department; and R. A. Neal, sales manager in charge of central station has been announced by J. S. Tritle, vice president of Westinghouse Electric & Mfg. Co.

Paul Davis Returns

Paul Davis, manager of the Studebaker, Pierce-Arrow Export Co., returned on Monday aboard the S. S. Leviathan from a trip to Europe, accompanied by Mrs. Davis.

Harper Slated to Head Willys' Sales

By G. W. HIBBERT TOLEDO, July 20—Harry B. Harper, widely known in the automobile industry and former general sales manager of the Willys-Overland Co., is slated to head the sales organization of this company again as successor of George M. Graham, who resigned as vice-president in charge of sales, effective July 11.

Mr. Harper has been with the Air-Way Electric Appliance Corp., of this city, in charge of its sales in the Philadelphia territory including three states. He has been in charge of this work for about four years and exceptionally successful.

It was largely due to the close cooperation and community of interest of large stockholders and directors of both companies that Mr. Harper's services were secured for the Willys-Overland Co.

Mr. Harper originally joined the Willys-Overland organization in 1911 as export manager. A year later he was named assistant sales manager under the late George W. Bennett and in 1913 became the general sales manager.

Prior to 1920 Mr. Harper left Willys-Overland to join the Stude-baker Corp., at South Bend. Four years ago he joined the Air-Way Electric Appliance Corp., in the distribution of an electric cleaning device. C. O. Miniger and T. H. Tracy, directors of the Willys-Overland Co., are also directors of Air-Way.

It is expected Mr. Harper will take up his new duties about Aug. 1.

Tells Japan How to Plan Highways

George F. Bauer, secretary of the Export Committee of the National Automobile Chamber of Commerce, has just completed speaking in 14 cities in Japan, outlining the possibilities of highway construction and traffic control, also proper taxation of motor vehicles. He is continuing his trip throughout the Far East and he will speak in a number of the other Asiatic countries.

Delargey Goes to Detroit

Leon F. Delargey, general purchasing agent for Wilcox-Rich Corp., Saginaw, for the past two years, has been transferred to the company's general offices in Detroit. He will be in charge of purchases for the company's three Michigan plants, located in Saginaw, Marshall and Battle Creek.

Weiss Elected Director

Henry Weiss, president of the Checker Cab Sales Corp., has been elected a director of the Checker Cab Mfg. Corp. to fill a vacancy. Other directors were reelected.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, July 24-Mid-summer NEW YORK, July 24—Mid-summer dullness in business is apparent on all sides, but retail trade is reported to be around last year's level. Wholesale trade in general is quiet. Collections are improving in some sections, although for the country as a whole they are still slow. Good crops have been harvested in this country so far, but demand is only fair, and prices are low.

slow. Good crops have been harvested in this country so far, but demand is only fair, and prices are low.

The Guaranty Trust Co.'s preliminary index of business activity for June stood at 69.2, as against 71.4 for May and 87.7 a year ago. The Guaranty Trust Co.'s index of wholesale commodity prices on July 15 was 49.4, as against 47.8 a month earlier and 64.0 a year ago.

A report of the Bureau of Labor Statistics states that the level of employment in 15 major industrial groups during June declined 2.0 per cent, while payroll totals declined 4.5 per cent.

Railway freight loadings during the week ended July 4 totaled 667,879 cars, which marks a decrease of 124.174 cars below those a year ago, and a decrease of 243,264 cars below those two years ago.

Cotton consumed in the United States during June amounted to 516,821 bales, including linters, as against 532,719 bales during the preceding month and 464,432 bales a year ago.

Average daily crude oil production for the week ended July 11 amounted to 2,544,650 barrels, as against 2,482,500 barrels for the preceding week and 2,530,800 barrels a year ago.

Professor Fisher's index of wholesale commodity prices for the week ended July 18 stood at 69.3 as against 70.4 the week before.

Bank debits to individual accounts outside of New York City during the week ended July 15 were 21 per cent below those a year ago.

The stock market last week declined further, mostly the result of the anxiety regarding the acute financial situation in Europe. Prices all around were lower for the week lefter and result of the surface of trading was light.

Brokers' loans in New York City during the week ended July 15 declined further, woult of trading was light.

However, the volume of trading was light.

Brokers' loans in New York City during the week ended July 15 declined \$25,000,000, bringing the total down to \$1,430,000,000 as compared with \$3,243,000,000 a year ago.

The consolidated statement of the Federal Reserve banks for the week ended July 15 showed a decline of \$22,000,000 in holdings of bills bought in the open market. Holdings of Government securities increased \$10,000,000, while holdings of discounted bills remained unchanged. The reserve ratio on July 15 was 84.1 per cent, as against 84.2 per cent a week earlier and 84.4 per cents two weeks earlier.

Midland Shipments Gain

CLEVELAND, July 22-The Midland Steel Products Co., during the first six months of 1931, shipped the largest volume of four-wheel mechanical brakes for any similar period in its history except 1929, according to E. J. Kulas, president. Shipments for the first half amounted to 92 per cent of the total shipments for all of 1930.

Frank H. Mason

Frank H. Mason, 78, a director of the B. F. Goodrich Co., died at his summer home near Akron, after an active career of more than 51 years with the

Akron tire manufacturing company. Working up to the positions of di-

rector, vice-president and vice-chairman of the board of directors, after starting in the Goodrich factory in 1879, he was one of the oldest active rubber officials. Although retired 15 years ago, he retained an office at the plant and spent several hours daily in connection with his company's activities.

Mr. Mason was one of the col-leagues of Dr. B. F. Goodrich, founder of the company, and at his death was one of two remaining persons active in Goodrich who were associated with the founder. The other is Mrs. Illa N. Kirn, a secretary in the industrial relations department.

Mr. Mason was born in Vermont.

General Tire **Brake Shields**

NEW YORK, July 20-General Tire and Rubber Co. has introduced a rubber brake shield, designed to make internal brakes waterproof and dirt-proof. These shields are known under the name of Perfection brake shields.

They can be installed in less than 30 minutes on most cars and trucks having detachable wheels, or can be applied in 10 minutes at the time brakes are being relined. They are designed to prevent frozen brakes, slipping or dragging brakes and scored drums, and to provide more uniform

Hudson Essex Sales Gain

DETROIT, July 20-Hudson and Essex sales for the last weeks in June reflected an upward trend which was continued into July, when sales for the week ending July 4 showed a substantial increase over the previous week and a decided increase over the same period one year ago, according to Chester G. Abbott, merchandising director and a director of the com-

Hudson will not shut down this month and any increased schedule will be taken care of by the forces now employed.

Traffic Fatalities Low

NEW YORK, July 20-Motor vehicle fatalities in greater New York during the first half of 1931 were lower than the corresponding period last year, according to figures announced by the Police Department. Fatalities to children under 16 years of age show a slight increase during the first half, although the second quarter shows a reduction.

Aviation Corp. Reports Loss

NEW YORK, July 20-Aviation Corp. of Delaware and its subsidiaries report net loss for the first six months of the current year of \$729,480. This compares with a net loss for the corresponding period last year of \$3,236,-

Gar Wood Faces Severe Test

Harmsworth Trophy Run Scheduled for September Will See Fast Driving

DETROIT, July 20-The 17th running of the British International (Harmsworth) Trophy Race will be the feature event of the Motor City's 15th international regatta to be held on the Detroit River Sept. 5, 6 and 7. Reports that Kaye Don has just piloted this year's challenger, Miss England II, in which the late Sir Henry O. D. Segrave lost his life a year ago during speed trials in England, to a new official record of 110.223 m.p.h. over Lake Gardia, in Italy, seem to justify the quite general be-lief that Commodore Gar Wood faces the severest competition he has encountered in the ten years he has faithfully and successfully defended the title.

The first race for the Harmsworth Trophy, according to announcement by the Detroit Gold Cup Committee, Inc., will be at 5.30 Eastern Standard Time, Saturday afternoon, Sept. 5. Six laps around the course off Belle Isle in front of the Detroit Yacht Club total the thirty nautical miles specified for the event in the deed of gift of the trophy. The second race will be Monday, Labor Day, at the same hour. If the second race leaves honors equally divided the third will be run at 5.30 Tuesday afternoon, Sept. 8.

Miss England II has a somewhat revolutionary feature in that her two Rolls Royce Schneider Cup engines, developing 2000 hp. each, are both geared to a single high speed pro-peller. Unlike Gar Wood's racing craft, Miss England carries her pilot and mechanic forward of her engines instead of aft.

It is understood that Gar Wood is busily engaged rebuilding Miss America VII and Miss America IX and tuning their Packard power plants up.

Campbell, Wyant, Cannon Foundry Earns 85c

CHICAGO, July 22—Net earnings of Campbell, Wyant & Cannon Foundry Co. for the first six months of 1931 were \$296,000 after all charges, equal to 85 cents a share on outstanding capital stock. For corresponding period of 1930 net profit amounted to \$583,496, or \$1.68 a share.

Balance sheet as of June 30 last shows a ratio of current assets to current liabilities of better than 6 to 1. Cash and call loans were in excess of

\$1,000,000.

G. N. Buffington yesterday was elected a member of the Campbell directorate. The regular quarterly dividend of 25 cents a share was declared.

Railroads Renew Plea for Federal Regulation of Motor Vehicles at I.C.C. Rate Raise Hearing

By L. W. Moffett

WASHINGTON, July 23—Recurring suggestions for federal regulation of motor transportation marked the plea before the Interstate Commerce Commission of the railroads for a 15 per cent advance in freight rates. At no time were detailed plans for control of motor trucks and buses laid before the commission, but that this service is a source of worry to the rail lines was plainly evident from the frequent reference to its effect on rail traffic.

It was more than once pointed to as possibly making ineffective if not actually detrimental, any increase that might be given railroads in freight rates. The thought manifestly was prompted by the suggestion that higher rail rates would necessarily turn more traffic to motor and other forms of competing service, assuming higher rates were not also applied by competing services. The railroad executives readily conceded the soundness of the view.

Both Interstate Commerce and state commissioners, who are sitting jointly at the hearings, frequently asked about the effect of motor competition.

The subject was gone into at some length, especially during the testimony of H. A. Scandrett, president of the Chicago, Milwaukee & St. Paul Railroad, who represented all of the Western carriers.

Replying to a question from one of the commissioners, Mr. Scandrett said emphatically that Western roads are concerned with truck and bus competition.

"Have the carriers been able to form any judgment about the effect of truck operation on their business?" he was asked. "We have studied it," Mr. Scandrett responded, "but the Milwaukee system has not felt justified in going into the trucking business."

That the carriers would first reduce any rates that might be advanced where injury had been done to their traffic from motor competition also was made clear. Mr. Scandrett, in discussing this phase of the question, declared that he did not feel that any railroad would put permanently into effect rates which would drive freight to other carriers.

The railroads specifically asked the commission to leave the "case open" in the event increased rates were granted so that they could be readjusted to meet competition or other requirements necessary to get traffic, and therefore additional revenue.

The commission has made no ruling on the subject, nor has it determined definitely its further procedure in the case. The railroad side was completed last Tuesday, when Commissioner Meyer, chairman of the hearings, replied to pleas of railroad security holders and of the railroads to expedite the case by saying the commission would make "further announcement as expeditiously as possible." Interestingly enough, attorneys for security holders have been more insistent upon speeding up of the case than have the railroads themselves. One attorney requested that a decision be made by Sept. 1. Shipper organizations through their attorneys have vigorously opposed the increase and asked that the commission proceed with its original schedule, which calls for resumption of hearings on Aug. 31, when protestants will be heard and when railroad witnesses will be cross-examined. Indications

are that this program will be followed, or at least, that the commission will not deviate much from it. Decision in the case generally is not expected to be made before Dec. 1, which would mean that any change in rates probably would not become effective before Jan. 1.

Life insurance companies and mutual savings banks which hold large quantities of railroad securities have particularly rebelled against what they consider undue delay by the commission. The commission has said, however, through its chairman, Mr. Baird, that its judgment will not be im-properly influenced in this or any other matter. It will continue, Chairman Baird said, "as it has in the past, to render its decision based upon 'the record as made,' undisturbed by all the winds that blow." This dig from the chairman was directed against propaganda for speeding the case and forcing a favorable decision for the railroads. It was carried in a note addressed to Senator Capper of Kansas, who had written the commission vigorously attacking Representative Beck of Pennsylvania for assailing the commission's supposed slow procedure and "circumlocution," and actually, if not seriously, suggesting that it be abolished by Congress. It is under-stood that the railroads have not reacted at all favorably to the Beck outburst.

Speedy and favorable decision was repeatedly, almost constantly, urged by the security holders' interests, who were quick to urge federal regulation of motor transportation, but asserting it could not be done in time to save the day for the railroads in their present plight, as pictured by them before the Commission.

Three Makes of Cars Gain in Registrations

WASHINGTON, July 22—Of the 33 makes of automobiles built by 23 manufacturers, only three showed gains in registrations in the first five months of 1931 over the same period of last year, according to registration figures for the 48 states and the District of Columbia.

Auburn Automobile Co. was only manufacturer to show a gain in its complete line, combined Auburn and Cord registrations being 122 per cent greater for the first five months of 1931 than during the same period of 1930. Buyers of Auburn and Cord cars registered 16,516 cars in the first five months of 1931 as against 6451 for the same period last year. Auburn registrations alone were 145.6 per cent greater.

These compiled registration figures show that Cadillac increased its registrations for the five months' period 25.4 per cent over the first five months of 1931 and Willys registrations were 6.5 per cent greater.

Johns-Manville Profits Up

NEW YORK, July 20—Johns-Manville Corp. and subsidiaries report net profit for the second quarter of the current year of \$715,657 after all charges. This is equivalent, after preferred dividends, to 78 cents a share on common stock, and compares with earnings of \$998,529 or \$1.16 a share for the corresponding quarter of a year ago.

Six months' earnings are \$945,767 or 91 cents a share, as compared with \$1,740,160, or \$1.97 a share for the first half of last year.

Free Wheeling Offered Optional on Chrysler 6

DETROIT, MICH., July 22—Chrysler Sales Corp. announced free wheeling, available on the Chrysler Six as optional equipment at \$20 extra cost.

Purchasers of the car may choose the standard three-speed with easy-shift gears; this same transmission with free wheeling, or the multi-range with dual-high gears as used on the Imperial, the Eight and "70" Chrysler.

Chicago-Washington Air Service Begun

DETROIT, July 22—Continental Airways inaugurated their new high speed de luxe service between Chicago and Washington, July 19. The air mileage to be covered approximates 600 miles via Canton and Pittsburgh.

General Motors Six Months' Income Shows Gain of 3.3% Over 1930 Period

(Continued from page 139)

preferred stock, of \$79,434,637, or \$1.83 per share, on the common stock outstanding.

This compares with net operating profits of \$98,355,355 for the first half of last year, or the equivalent, after preferred dividends, of \$2.15 per share on the common stock. Total net earnings, operating and non-operating, were \$105,932,428 in the first half of last year, or the equivalent, after preferred dividends, of \$2.32 per share on the common.

Cash, U. S. Government and other marketable securities, at June 30, 1931, amounted to \$245,856,668, as compared with \$179,037,071 at Dec. 31, 1930, and with \$175,693,782 at June 30, 1930. Net working capital at June 30, 1931, amounted to \$328,651,750, compared with \$281,037,636 at Dec. 31, 1930, and with \$290,577,234 at June 30, 1930.

Attention is called to the fact that the financial position of the corporation has not only been maintained during the period but has been materially strengthened. Cash and cash items were approximately \$70,000,000 greater than at the close of the period a year ago, and approximately \$66,800,000 greater than at the end of December of last year. Net working capital position likewise has been substantially improved.

During the second quarter ended June 30, 1931, General Motors dealers in the United States delivered to consumers 361,683 cars, compared with 371,139 cars in the corresponding quarter of 1930. Sales by General Motors operating divisions to dealers in the United States for the second quarter amounted to 369,677 cars, as compared with 356,129 cars in the corresponding period of 1930. Total sales to dealers, including Canadian sales and overseas shipments, amount-

ed to 419,650 cars, compared with 395,584 cars in the corresponding quarter of 1930.

For the six months ended June 30, General Motors dealers in the United States delivered to consumers 593,564 cars, compared with 657,829 cars in the corresponding period of 1930. Sales by General Motors operating divisions to dealers in the United States amounted to 625,674 cars, as compared with 679,572 cars in the first six months of 1930. Total sales to dealers, including Canadian sales and overseas shipments, amounted to 724,197 cars, compared with 764,219 cars in the corresponding period of 1930.

From the above statistical statement of the operations of the corporation it will be noted that the earnings for the second quarter were 3.3 per cent above operating earnings for the corresponding period a year ago. Total sales of cars in units by the corporation to its dealers exceeded the corresponding item of a year ago by 6.1 per cent. While progress has been made in injecting into the corporation's operations further operating economies, the influence on net profits has been offset by the shift of demand to lower priced units, reflecting the general circumstances prevailing during the period under review.

Sales of the automotive industry as a whole to consumers in the United States were approximately 27 per cent less in the second quarter than a year ago. Sales of General Motors cars to consumers were 2.5 per cent less in the second quarter than a year ago. The more favorable comparison of the corporation's sales is accounted for by the fact that the corporation is enjoying a somewhat larger percentage of the business available than was the case last year.

Perfect Circle Profit \$3.04

CHICAGO, July 22—Earnings report of the Perfect Circle Co. for six months ended June 30, 1931, shows net profit of \$494,662 after all charges, including federal taxes. This is equal to \$3.04 a share on 162,500 shares of stock outstanding, or over 50 per cent in excess of the entire year's dividend requirement of \$2 a share. For the first half of 1930 the company had a net income of \$368,057, or \$2.26 a share.

Bohn Profits \$2.62

DETROIT, July 21—Bohn Aluminum & Brass Corp. have reported for the six months ended June 30, 1931, net profit of \$925,558, equal to \$2.62 per

share, on 352,418 shares of no par common, comparing with \$688,766, or \$1.95 per share, in the same period last year.

Second quarter earnings this year totaled \$486,337, or \$1.38 per share, against \$439,221, or \$1.24 per share, in the first quarter this year and \$292,507, or 83 cents a share, in the second quarter last year.

Dodge Retail Sales Gain

DETROIT, July 21—Overall retail deliveries of passenger cars, trucks, school buses and taxicabs by Dodge Brothers dealers in the United States for the period ending July 11 showed an increase of 39.2 per cent as compared to the preceding week.

Air Line Owners Urge Fewer Rules

Limitation of U.S. Regulations to Rules of Safety to be Asked

NEW YORK, July 22—Limitation of government regulations concerning air line operation to matters bearing directly on safety will be urged by the transport operators at a conference with officials of the Aeronautics Branch, Department of Commerce, to be held in Washington next week.

Air transport operators feel that the regulations should be restricted to those which are essential to safety, and that such rules should be stated in general terms so the operators will have sufficient freedom to develop air transport service in a profitable and efficient manner. Detailed regulations placed in effect at the present time would hamper the development of this new form of transportation, a report of the Aeronautical Chamber of Commerce of America, Inc., says. Operators believe the present regulations, if rigidly enforced, are sufficiently complete to insure the safe operation of any air line.

In commenting upon the proposed amendments, all of the operators praised the work of the Department of Commerce, in administering the regulations governing air line operation in the past. "Those charged with the enforcement of these federal regulations, which have been in force since December 31, 1926, have displayed great patience and consideration during the past four years," the report says.

Bound Brook Forms Fischer Foundry Co.

The Bound Brook Oil-less Bearing Co. has formed a subsidiary to be known as the Fischer Foundry Corp. to manufacture a full line of bronze and aluminum castings.

The new company will occupy the foundry building now used by the Bound Brook company in Middlesex Borough.

The Fischer Foundry Corp. will have associated with them C. J. G. Fischer and L. A. J. Fischer, who have a thorough knowledge of the bronze and aluminum foundry business.

German Car Exports Gain

BERLIN, July 18—German automobile exports for the first five months of the year show a considerable increase over the same period last year on the basis of units. The total number of motor vehicles exported during the period January-May, 1931, was 3812, including 2686 passenger cars, while during the corresponding period last year the number was 2841, of which 1834 were passenger cars.

U. S. Purchases Keep Aero Sales Up

Chamber Production Report Shows Only 2.4% Decrease for Five Months

NEW YORK, July 22-Necessity for continued government support of the aviation industry through purchases of equipment for the military and naval air services is shown in a report on production by the Aeronautical Chamber of Commerce of America,

The report, giving aircraft produc-tion and sales figures for the first five months of 1931, shows the dependency of the new industry upon military con-Value of commercial airtracts. planes produced declined 47 per cent this year, as compared with the first five months of 1930. Commercial aircraft engine production was off 45 per cent. Sales fared slightly better, since the manufacturers are continuing to liquidate their surplus stocks. Commercial airplane sales dropped 40 per cent, while the reduction in powerplant deliveries was 28

Purchases of equipment by the Army and Navy, on the other hand, showed a decided gain. As a result of the growth in sales of military craft, the total value of all types of planes and engines sold in the fivemonth period just ended reached \$15,-727,098, as contrasted to \$16,110,536 in 1930, a reduction of only 2.4 per cent.

Production of commercial airplanes this year reached a total of only 717 units, with a valuation of \$2,982,671, less engines, as against 946 units valued at \$5,585,646 in the first five months of 1930. The valuation of the 712 commercial planes delivered by manufacturers in January, February, March, April and May, this year, was \$3,236,884, as contrasted with \$5,351,-856 for the 1001 commercial units sold in the corresponding period of 1930.

While more commercial aircraft engines were produced and sold in the first five months of 1931 than in the same months last year, values were considerably less.

Fageol Produces New Type Coach

OAKLAND, CALIF., July 20-A new street-car type of coach was introduced recently by the Fageol Motors Co., and 23 of these coaches have been delivered to the Pacific Electric Railway Co. for use in Pasadena.

The outstanding feature of this coach, which accommodates 28 passengers, is that the powerplant can be extended out in front on an electrically-driven subframe. It is claimed that the engine can be thus extended in 30 sec. and that it can be completely removed in 3 min.

Another feature is that the body and chassis frame are built in a single unit, to which all other parts of the mechanism are attached. This makes it possible to divide the complete coach into five different parts for inspection and service purposes, viz., the body and frame unit, the powerplant, front axle, rear axle, and transmission.

De Soto-Plymouth to Add 30,000 ft. Floor Space

DETROIT, July 22-Ground will be broken this week for 30,000 sq. ft. of floor space to be added to the De Soto-Plymouth plant. Every effort will be made to rush construction through to completion before the end of August.

The addition will be L-shaped and will follow the type of construction of the present plant building of which

it will be a part.

The driveaway department, when completed, will extend in a straight line through the space previously occupied by offices. There will be a separate entrance for drivers, rest rooms for dealers and customers, a bumper installation department, a driveaway wash rack, driveaway parking facilities, and a gas station at the exit.

The handling of cars for boat shipment will be taken care of in the plant instead of in the factory yard as here-

Method for Rubber Preparation

WASHINGTON, July 22 - A new preparation method for rubber has been invented by Mr. A. Meinesz, former administrator of the Padang Rubber Maatschappij, who has already applied for patents in Holland and Netherland India, the Federated Malay States, and Ceylon.

The advantages claimed of the method are:

1. Large quantities of latex can be made into a dry market product without the use of any chemicals.
2. No rubber mills are needed.
3. No smoke or drying house is required.

quired.

4. Less labor is required, as the process functions mechanically.

5. Small cheap factories are adequate for the process.

6. The dry crop yield is 8 per cent higher.

7. The cost of preparation is reduced to about fl. 0.02 per pound.

According to Dr. A. van Rossum of the Government Instruction Service in Delft, Holland, the rubber produced by this method is of good quality.

Durant Business Gains

NEW YORK, July 22-Business of Durant Motors, Inc., during June increased 74 per cent over May, Hal W. Alger, general manager, reports. The increase was brought about by the introduction of the new 619 model.

Ask Amendments To Aero Rules

Aircraft Manufacturers Submit Schedule to Department of Commerce for Approval

NEW YORK, July 22-More than 25 amendments to the government air-worthiness requirements for aircraft will be sought by manufacturers of commercial airplanes at a meeting with heads of the Aeronautic Branch. Department of Commerce, in Washington, D. C., July 31.

The changes are being asked with a view toward further increasing the safety of aircraft and as a means of bringing the regulations governing the design and construction of airplanes into conformity with the advances that have been made in engi-

neering in the past year.

In many instances, the manufacturers are seeking more stringent requirements for aircraft. Chief among the tentative proposals is one asking that light airplanes, which have been produced in large numbers since the first of the year, be required to exhibit the same spinning characteristics demanded of heavier craft.

Larger planes under the Department of Commerce rules must recover from a tail spin in less than a turn and a half after making six complete revolutions. The planes must do this with the controls in neutral and the power shut off. Knowing that the new light airplanes are going into the hands of private individuals, who as a rule are less skillful than the commercial pilots, the manufacturers are insisting that the light models be subjected to the same spinning test.

Chicago Pneumatic Reports Profit

NEW YORK, July 21-Chicago Pneumatic Tool reports net profit for the first six months of the current year of \$10,179, or 5 cents a share, as compared with \$287,771, or \$1.53 a share for the corresponding period a year

Earnings for the June quarter were \$8,737, or 4 cents a share, as compared with \$113,556, or 60 cents a share, for the second quarter of last

American Forging Declares 15 Cents

PONTIAC, MICH., July 22-Directors of the American Forging & Socket Co. declared the regular quarterly dividend of 15 cents per share on outstanding common stock, payable Aug. 1 to stock of record July 17.

Reo Shutdown Aug. 1

DETROIT, July 21-Reo Motor Car Co. have announced that the factory will be shut down for vacation period from August 1 to 17.

Automotive Industry Shows Highest June Labor Layoff Rate in Government Report

WASHINGTON, D. C., July 22-The Bureau of Labor Statistics of the United States Department of Labor, presents herewith June labor turnover rates for manufacturing as a whole and for 10 separate manufacturing industries.

The all manufacturing rates are made up from representative establishments employing approximately 1,250,000 people. For industry as a whole, the June accession rate was 2.41, and the total separation rate was

The highest accession rate for any of the industries for which separate figures are presented was shown by

the brick industry. This rate was 6.67. Iron and steel had the lowest accession rate, 1.20. The highest quit rate, 1.61, was shown by the boot and shoe industry. The lowest quit rate, .69, was shown by the foundry and machine-shop industry. The highest discharge rate, .52, occurred in the slaughtering and meat packing industry; the lowest, .11, in the iron and steel industry.

The automotive industry had the highest layoff rate, 10.57. The lowest layoff rate, .56, was shown by the men's clothing industry.

LABOR TURNOVER RATES PER 100 ON THE PAY ROLL-JUNE, 1931.

		Monthly rates Separation rates A			Acces-		Equivalent annual rates Separation rates Acces			Acces-
Industry	Quit	Dis- charge	Lay-	Total	sion	Quit	Dis- charge	Lay- off	Total	sion rate
All industries	1.02	.23	3.84	5.09	2.41	12.4	2.8	46.7	61.9	29.3
Automobiles	.90	.21	10.57	11.68	2.91	11.0	2.6	128.6	142.2	35.4
Boots and shoes	1.61	.40	1.85	3.86	5.18	19.6	4.9	22.5	47.0	63.0
Brick	.80	.44	5.45	6.69	6.67	9.7	5.4	66.3	81.4	81.2
Cotton	1.25	.46	2.24	3.95	3.66	15.2	5.6	27.3	48.1	44.5
Foundries-machine shops.	.69	.25	4.44	5.38	1.95	8.4	3.0	54.0	65.4	23.7
Furniture	1.06	.43	4.83	6.32	4.89	12.9	5.2	58.8	76.9	59.5
Iron and steel	.86	.11	2.65	3.62	1.20	10.5	1.3	32.3	44.1	14.6
Men's clothing	1.32	.23	.56	2.11	4.05	16.1	2.8	6.8	25.7	49.3
Saw mills	1.13	.33	8.70	10.16	6.41	13.8	4.0	105.9	123.7	78.0
Slaughtering-meat pack	1.36	.52	3.90	5.78	6.08	16.6	6.3	47.5	70.4	84.0

(The net turnover rate is the total separation rate or the accession rate, whichever is the lower.)

British Rubber Business is Strong

LONDON, July 20-Shares of stock of rubber producing companies, and the commodity market, were both strengthened slightly as a result of the more optimistic feeling engendered by the recent war debts proposal.

The Dutch are still discussing restriction plans, but British growers apparently believe no acceptable plan can be evolved. London opinion seems to be strengthening against artificial restriction, according to the U.S. Department of Commerce office here.

Must Regain Public Confidence

SPOKANE, WASH., July 22-"If business men would quit impressing upon their employees and customers that times are bad, and get busy to build up their own business, then the trade of this country would far more quickly return to normalcy, George H. Moriarty, vice-president and general manager of the Durant Motor Co., told the Spokane advertising Club last week.

"Business must regain the confidence of the public," he said, "and it is up to the individual business man to see that this happens."

Stutz Increases Surplus

INDIANAPOLIS, IND .- The financial position of the Stutz Motor Car Co. is reflected in a recent statement issued by Col. E. S. Gorrell, president, showing that Stutz' surplus increased \$2.332.541.48 between October 31. 1930, and May 31.

Walter H. Whiteside

Walter H. Whiteside, who was president of the Stevens-Duryea Co., Chicopee Falls, Mass., from 1911 to 1916, died at Pasadena, Calif., of heart disease on July 18, at the age of 70. Mr. Whiteside, who was born in Wabash, Ind., and graduated from Wabash College, was connected with the Westinghouse Electric & Manufacturing Company during the early part of his business career, and he also was president of the Allis-Chalmers Manufacturing Company, from which post he resigned in 1911. In 1916, when leaving Stevens-Duryea, he rejoined the Westinghouse Company which he served until he retired in 1926. During the last years of his connection with the Westinghouse Company he acted as its Pacific Coast manager.

Otis Orders Pickler

CLEVELAND, July 22-The Otis Steel Co. has placed an order with the Aetna Standard Engineering Co., Youngsown, for a continuous pickler to be installed in connection with the new continuous strip mill being built at the Riverside works of the com-The amount involved in the pany. order is \$100,000.

Reduced Prices Seen in Canada

Premier Bennett Points to Drawback Provisions in Present Tariff

OTTAWA, ONT., July 20-A reduction in the prices of a number of automobiles for Canadian buyers should result from a number of drawback provisions contained in the present tariff resolutions, according to the view expressed in the House last week by Premier R. B. Bennett.

His statement was made during a discussion of tariff items affecting automobiles. The debate was precipitated by remarks of Hon. Charles Stewart, former Minister of the Interior, who declared no reduction in the cost of cars could be expected and that the American purchaser of a Ford car had an advantage of \$100 over a Canadian purchaser.

"There is no change in the price of the Ford car," said Premier Bennett. "nor is there any change in the duty upon cars valued up to \$1,200. That remains at the figure that was fixed by the previous government."*

Mr. Stewart asked if the valuation fixed by order-in-council did not affect

the price of a Ford car.

The Premier said: "The tariff with respect to cars valued up to \$1,200 has not been changed. Second, the tariff on cars from \$1,200 up to \$2,100 has been increased 21/2 per cent on the general tariff, and that is all, but there had been a decrease in the intermediate tariff, and in addition in regard to cars the production of which we had deliberately encouraged there are provisions for free admission of a large number of the component parts used in the production of automobiles, thereby making provision for a reduction rather than an increase in price.

"I am sure that it will be found that a determined effort has been made for the first time to insure the utilization of Canadian products in the production of cars in this country.

"There is now invested in that industry alone nearly \$100,000,000 and in the production of parts about \$20,-000,000 more. Whether or not Canada should ever have embarked on an automobile industry is a question on which there might be a diversity of opinion among honorable gentlemen, but it is no longer a question.

"This Government today has not changed one iota the tariff on cars valued up to \$1,200, but it has divided cars into three classes, instead of two, as formerly. Then, by an order-incouncil, it has been provided that the commission reduction in value on cars imported into Canada should not exceed 20 per cent."

^{*}Canadians Restrict Automobile Imports, page 571, Automotive Industries, April 11, 1931.

Steel Producers Improving Plants

Smaller Production Schedules Enable Mills to Install New Equipment

NEW YORK, June 23-Developments show that although for the time being less than one-half of the steel industry's capacity is employed in production, this has in no wise affected the expensive mechanical improvement programs of many producers.

Completion is announced this week of the largest continuous plate mill, said to be the largest mill installation for the rolling of any steel product ever made. Another accomplishment recorded during the week is the direct casting of steel from two of what is eventually to be a battery of 10 open-hearth furnaces at a Middle West plant, it being claimed that the process used will result in lighter and stronger automotive castings.

All along the steel industry's line there is in evidence a desire to speed up the installation of more economical producing units, thus emphasizing steel producers' faith in the early re-

covery of demand.

Another significant development is increased interest on the part of the large steel producers in secondary fabricating processes and in the marketing of steel in a more highly finished stage. To relieve the dullness of the market there is revival of the everrecurring rumor that Detroit is soon to take its place by the side of Pittsburgh, Cleveland and Chicago as a steel price-basing point.

Fig Iron—In some of the markets more activity is noted. Consumers generally look upon prevailing prices as rather attractive, but are not in the mood to anticipate their wants more than is neces-

Aluminum—Somewhat better demand is looked for from automotive consumers

Sary.

Aluminum—Somewhat better demand is looked for from automotive consumers during the first half of August. Stocks in consumers' hands are virtually nil, and any increase in their operating schedules is certain to be immediately reflected in larger takings of aluminum. Prices are unchanged.

Copper—German buying of American copper, presumably with a view to placing foreign bank balances beyond governmental control and yet invested in a promising manner, lifted the market from its low of 7% to 8 cents, delivered Connecticut. France was also a buyer. Domestic demand turned more active.

Tin—Quiet and steady.

Lead—Demand has turned light.

Zinc—Quiet and firm.

Bohn Earnings Increase

NEW YORK, July 20—Bohn Aluminum & Brass Corp. reports net profit for the first six months of the current year of \$925,557. This is equivalent to \$2.62 a share on common stock, and compares with earnings of \$688,-766 or \$1.95 a share for the first half of last year.

General Tire Co. Denies "Third Line" Allegation

AKRON, July 24-Several large news services and daily newspapers recently reported that the General Tire &

Rubber Co. together with two other major rubber companies had reduced prices on their "third lines" of tires to meet a reported similar mail-order tire price cut.

Referring to this report, William O'Neil, president, said: "General is not affected by any change in tire prices on second or third line tires, as we manufacture only one highgrade line, consequently reports that we have reduced tire prices following reductions by other companies on third-line tires is incorrect.'

Maddock is Essex Rubber Receiver

TRENTON, N. J., July 23—Federal Judge John Boyd Avis has appointed Harold S. Maddock receiver for the Essex Rubber Co., and its subsidiary, Vulcan Recovery Co. A petition for the receivership was filed by Arthur E. Moon, of Morrisville, Pa., treasurer of Essex, so the company could be organized and its assets conserved. The liabilities of the company are exceeded by its assets.

Louis G. Meister

Major Louis G. Meister, 40, one of the country's best known test pilots, met death half a mile northwest of Wayne County airport at 9.45 a. m. Sunday, when he was forced to abandon a new plane he had taken aloft for a trial flight. Apparently he delayed pulling his parachute rip cord too long to save

Pierce-Arrow Earns \$421,711 in 6 Months

NEW YORK, July 21-Pierce-Arrow Motor Car Co. and subsidiaries reports net profit for the first half of the current year of \$421,711 after all charges. This is equivalent, after preferred dividends, to 4 cents a share on Class B stock.

Earnings for the June quarter were \$115,262, or 4 cents a share on Class A stock, and compares with \$569,277, or \$2.32 a share, on combined Class A and B stocks.

Spencer is Promoted

K. Ray Spencer was appointed De Soto district manager for Kansas City district. He had charge at one time of the Kansas City Chrysler sales office.

Buick Building All **Engines in One Plant**

FLINT, July 23-Moving an engine plant without interrupting production was the feat recently accomplished at the Buick Motor Co. As a result of the move, engines for the Buick 8-50 series of cars are now built in the same plant as the larger Buick motors, the 8-60, 8-80 and 8-90 series, the entire engine machining and assembly operations being housed in plant No.

More than three hundred pieces of engine-building equipment were moved in consolidating the two plants, which are known as Plant No. 11 and Plant No. 56, the latter plant having been devoted to the 8-50 motors.

In the new setup No. 11 is entirely devoted to Buick engine-building. As production schedules had to be maintained during the shift, the machinery was moved according to a carefully prepared program that permitted the schedules to be steadily maintained. It took eight weeks to complete the transfer.

The Buick engine plant now covers the immense area of 600,000 sq. ft., a total of 15 acres.

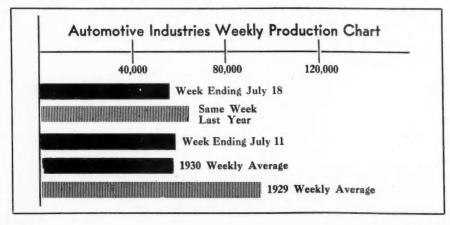
Dorland, Phelps Merge

DETROIT, July 22—A merger has been effected between Dorland International, Inc., New York, and the foreign advertising department of George Harrison Phelps, Inc.

Mooney Returns

NEW YORK, July 22-James D. Mooney, vice-president of the General Motors Corp., in charge of exports, returned yesterday aboard the S. S. Europa from a trip to England and the Continent. High tariff and high gasoline prices have made it extremely difficult to sell American automobiles in Europe, Mr. Mooney pointed out.

Mr. Mooney also indicated that the European countries were improving in their own production of motor vehicles and increasing the competition for American cars. However, he looks forward optimistically to a steady growing market in other sections of the world.

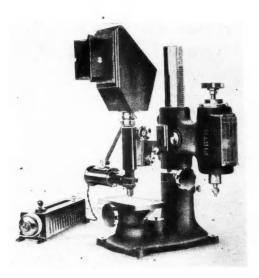


NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Firth Hardometer Uses Steel Balls or Diamond

THE Firth Hardometer, which is being sold in this country by Tinius Olsen Testing Machine Co., Philadelphia, operates on the standard ured, instead of its depth. The diameter or diagonal is from eight to sixteen times as great as the depth of impression and unusually accurate results are said to be obtained with the Hardometer. The diameter of the impression is measured with a microscope.



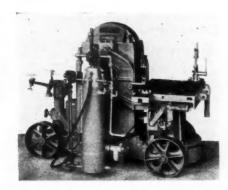
Howell Adds Fractional Line

OWELL ELECTRIC MOTORS CO., Howell, Mich., has added a new line of fractional horsepower motors, Type CI, from ½ to ½ hp. capacity. This line consists of condenser start, split phase and polyphase motors, all built in a frame with the same mechanical dimensions.

They are high starting torque constant speed motors having at full voltage, a starting torque of from 300 to 400 per cent of full load torque, and a maximum running torque of at least 200 per cent of full load torque.

sary to making a perfect draw, and insures good molds without patching. The pattern draw guide is self-aligning and is ball-bearing. It is also oilless and needs no lubricant. The machine is, as shown, fully inclosed and protected from sand.

Table size 18 in. x 28 in., draw 10 in. Capacity 350 lb. (with 80 lb. pressure)



Barber-Colman Unit For Indicator

BARBER-COLMAN CO., Rockford, Ill., announces a new unit called the Indicator Finger, which is designed for getting at many places that cannot be reached by a regular indicator. The Finger is clamped to the case barrel surrounding the indicator plunger so that the curved end of the bell crank rests against the end of the plunger. Thus a movement of the ball end of the bell crank is transferred accurately to the indicator.

(Turn to page 148, please)

Brinell principle but uses lighter loads and either a small steel ball or a diamond pyramid as an indenter.

The small steel ball is used on thin or soft materials. The diamond pyramid is used on the hardest material, and the instrument is adaptable for use on case-hardened, cyanided and nitrided surfaces, on small objects such as hardened gear teeth, and on material where it is desirable to restrict the mark made by the hardness tester to a minimum.

Loads of 120, 30 and 10 kg. are used, depending on the general character of the hardness testing to be done. All of these loads may be used with either the steel ball or the diamond pyramid. With the 120-kg. load can be tested hard and medium steels down to 1 mm. thickness, and soft metals down to 2 mm. thickness. This covers the average range of materials tested, and is the capacity generally used. With the 30-kg. load cylinder similar materials down to ½ mm. or 1 mm. thickness may be tested. For very thin materials the 10-kg. load cylinder is used.

The Firth Hardometer differs from other instruments intended for the same purpose in that the diameter or diagonal of the impression is meas-

Tabor Molding Machine

TABOR Jar, Rollover and Pattern Draw Molding Machine, the first of which was recently exhibited at the American Foundrymen's Convention at Chicago, has been placed on the market by the Tabor Manu-facturing Co., Philadelphia, Pa. The machine has an effective long-stroke jarring blow and requires a minimum of time for the ramming of molds. The rollover mechanism is oil controlled, thus being absolutely while operating at high speed. machine will roll over in four seconds. The table is free of the rollover frame during the jarring operation, but it is locked securely to the rollover frame when the machine is rolling over. This locking is automatic and is positive. Under no condition can the plate be thrown.

The leveling mechanism is entirely automatic and levels the flasks instantly when the leveling device contacts the bottom board of the flask on the machine. The operator is not required to touch this leveling member, as it is controlled from the valve stand of the machine. The pattern draw is also oil controlled, giving the slow start and steady draw so neces-



Automotive Industries

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Ex-Cell-O Semi-Automatic Spindle

RECENTLY the Krueger Division of Ex-Cell-O Aircraft Tool Co. was called upon to design a multiple tapping machine for tapping work while submerged. Twenty-one full adjustable spindles were provided on the machine, with a minimum center distance of 7/16 in., and the spindles were designed for drilling or tapping

holes not to exceed 1/4 in. diameter. The complete machine is shown herewith. Suitable fixtures are mounted on the table which is raised to meet the drills or taps. The table proper is mounted on two plungers within a tank filled with cutting compound. The table unit is so designed that when the foot pedal, shown in the lower part of the photograph, is pressed downward the center work table remains stationary for a portion of the stroke while the outer or tank portion moves upward. This movement causes the work to be submerged in the cutting fluid in the tank portion of the table and it is at this time that the drilling or tapping operation is performed. The whole table assembly is counterweighted so that the weight of the fluid, together with the work and work table, is so balanced as to insure ease in operating the foot pedal.

Tapping spindles are threaded through their support arm to the correct lead for the thread of each individual tap. By this arrangement the taps are fed into the work correctly, eliminating the possibility of cutting away or stripping the first few threads of the hole being tapped. A reversible motor is provided with the machine when it is to be used for tapping.

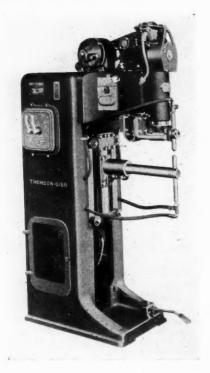
The spindle drives are of standard universal joint construction, due to the range of center distance that must be made. Three cluster gears driving through worm gears operate each group of spindles in the upper portion of the head. This type of drive is substituted for the conventional spur gear-drive assembly. The worm shaft and motor are connected by means of Texrope drive which insures quiet operation as well as eliminating the shock when the motor is reversed during the tapping operation.

Thomson-Gibb No. 1 Press Welder

PRICED at less than \$1,000, the No. 1 press welder has been placed on the market by the Thomson-Gibb Electric Welding Co., Bay City, Mich., for medium duty automatic spot and projection welding.

jection welding.

It has smooth, straight spindles, and press type action which is said to preserve the life of the machine and the welding electrodes. One of

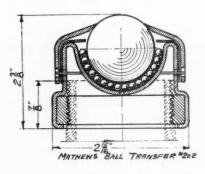


the features of the machine is flexibility through unit construction which permits changes at minimum expense. Welding capacity in continuous production is two pieces of 14 gage steel.

The driving mechanism is mounted on top of the machine and consists of two simple units—a motor and a worm reduction and clutch. The transformer is water-cooled and arranged to give 16 variations of welding heat. Welding pressure is adjustable up to a maximum of 900 lb. Ordinarily this is a single-speed machine being available in speeds of 30, 40, 50, 60, 80, 100, 130, 145 or 160 spots per minute, as desired. However it can be furnished as a four-speed machine at added cost. It is available in throat depths of 12, 18 and 24 in. Transformer capacity 20, 30, or 40 kva.

New Ball Transfer Solves Many Handling Problems

NEW type of handling equipment, known as the Mathews Ball Transfer, has been designed by the Mathews Conveyor Co., Ellwood City,



Pa., to accommodate the movement of any objects having smooth, hard surfaces such as sheets or strips in any direction on a horizontal plane. This device is made up with a large hardened steel ball which rotates on a series of smaller balls held in a cupped base.

Two models are available, one for mounting in series on a table of flat surface support, and one for mounting on pipe supports. When mounted in groups on a heavy structural support it provides an effective means of moving heavy shapes to and from shears, for conveying boxes to and from a line of roller or power conveyor, for handling heavy cores or molds when these loads are placed on smooth bottom plates.

The Type 200 is constructed with a

4 in. diameter round base, with four holes for mounting. Type 201 has a 3 in. square base with four holes for mounting. Type 202 has a threaded coupling base for 2 in. standard pipe. These three types have a load rating of 200 pounds each. The Type 500 is similar to the Type 202, but of heavier proportions throughout, and has a load rating of 500 lb. each. The base is of drop forged steel, threaded for 2 in. standard pipe.

(Turn to page 150, please)

A NEW WHEEL BY BUDD

Motorists who prefer the artillery type of wheel can now have that type in the material that rapidly is becoming universal in wheels—STEEL1

For Budd—after testing, and after experimenting for years—now offers to the automotive world the first successful steel artillery wheel.

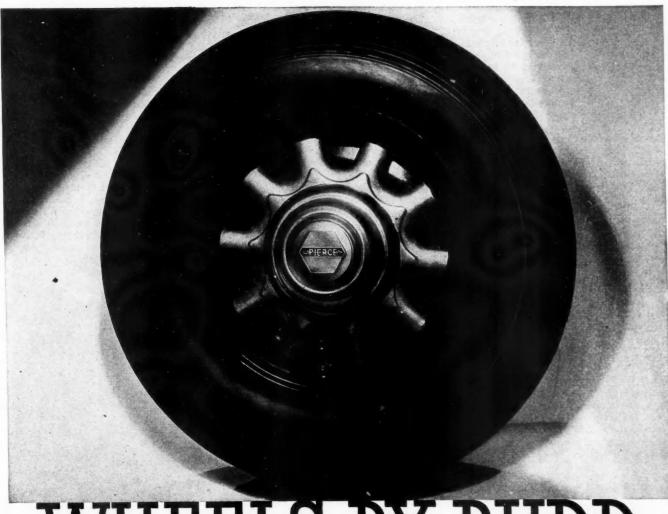
Beautiful? Look at it. But more. It is six pounds <u>lighter</u> than an equivalent wood wheel. In lateral tests, it proves to be four to five times stronger. And it permits better decoration at less cost.

This wheel is made in both low-carbon steel, and in stainless steel. In low-carbon steel, it can be given a natural wood finish—or can be finished in lacquer the same as the body. And finishing is a matter of hours—instead of the days necessary with wood.

In stainless steel, it harmonizes with any color scheme
—contributes brilliance and richness.

This new Budd-Michelin wheel is displayed at the Budd plants in Philadelphia and Detroit. We'd like you to see it. We'd like to tell you more about it.

Stainless Steel Wheel as Designed for Pierce Arrow



*WHEELS BY BUDD *

Automotive Industries

July 25, 1931

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Geometric Tap For Two Holes at Once

THE Geometric Tool Co. of New Haven, Conn., has added a Combination Solid Adjustable Tap to their line. It is equipped with ground thread chasers for tapping 2 1/16 in.-14 and 2 11/32 in.-14;

in.-14 and 2 11/32 in.-14; both U. S. S. form. Incidentally the customer using this tap has several other similar geometric combination solid adjustable taps at work on other sizes.

The two taps are independent of each other and have individual and separate size adjustment control. Thus both holes may be tapped to the required decimal size. Where desired the front tap may be removed and the back tool employed as you would any solid adjustable tap.

These taps can be equipped with ground thread chasers (in U. S., V., and American Briggs thread forms) or with machine cut chasers. The two tapped holes must be, naturally, of the same pitch and preferably should be through

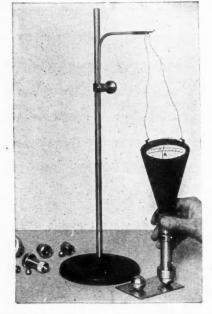
While the tap shown happened to be used on a chucking machine, similar tools can be used on any type of machine where a solid adjustable tap can be employed.

Coats' Mikrotast Ball Gage

holes

AGING balls is said to be greatly facilitated by the Mikrotast gage recently placed on the market by the Coats Machine Tool Co., New York, N. Y.

This is a development of the Mikrotast saddle gage. The angle of the cone which straddles the ball is approximately 39° (38° 56'), and the gaging contact pin, actuating the indicator, is located in the axis of this angle. The straddle cones are made of Krupp "Nitralloy." The angle of approximately 39° is the only one providing a 1:1 ratio between diameter variation and travel of gaging contact pin. Up to 0.394" diameter the straddle cones are attached to the adapter by means of a cone retaining chuck, above 0.394" and up to 1.968"



diameter, they connect with the adapter through a clamping sleeve. The gage may be used with or without the stand shown. For continuous inspection the inspector will find the surface gage type stand useful.

The gage obviates the necessity for picking up the steel balls, an advantage that will be readily appreciated in the case of very small diameter balls, usually requiring the use of tweezers. In a chute or trough the balls are guided toward the plate, are straddled with the gage and, after gaging, are directed into any given number of exit channels.

Everlock Washers

THIS lock washer, being manufactured by Thompson-Bremer & Co., Chicago, has die-shaped teeth on both sides which dig into the nut and the work. The teeth being dieshaped instead of being merely twisted, they retain their shape and when the pressure on the washer

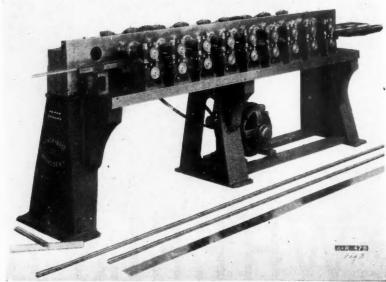
is released, they spring up again. These lock washers are made of high-carbon steel, hardened and tempered. They are claimed to be positive in their locking action.

Kane & Roach Forming Machine

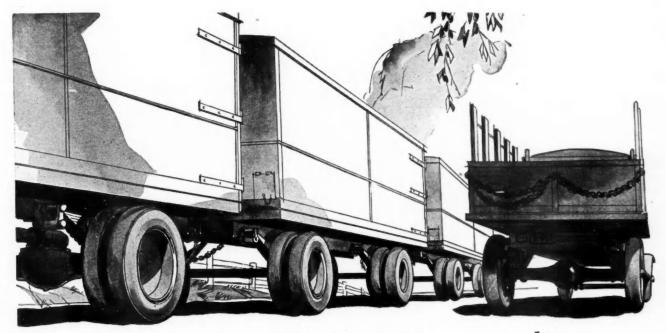
NE of the new cold-roll forming machines recently placed on the market by Kane & Roach, Inc., Syracuse, N. Y., has found wide acceptance in the automotive field. The illustration shows a special design for producing a patented retainer strip for gypsum boards. This machine is of standard construction, having 11/2 in. shafts, 41/8 in. diameter rolls, 8 in. horizontal centers, and a roll space of 6 in. The shearing and forming of the scalloped edge on this retainer strip are done simultaneously in the ninth set of rollers by means of a built-up roll with shearing edges.

Among the automotive applications of this machine are the following: Rolling auto tire covers, windshield wiper housings, running board, lamp door bands, molding and molding strips, structural shapes, etc. One manufacturer is using this machine for forming and bending completely two distinctive gasoline pump dial rings. The material is run through the machine at approximately 75 ft. per minute. Another machine is used by a lamp manufacturer for bending and forming two types of lamp bands.

(Turn to page 152, please)



Kane & Roach Forming Machine



Making the Wheels go Round

Hauling merchandise by motor trucks is an immense industry—but it's going to be a lot bigger. Increasingly gasoline power is a vital factor in freight transportation. Small units or heavy duty—what's the difference?

Timken Axles for thirty years have made truck wheels go 'round; hauling merchandise — dependably, cheaply.

As motor freighting grows, more and more will be known about costs—to fractions of pennies; necessary.

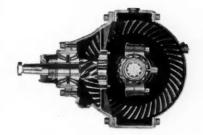
The better costs are known, the better the picture for Timken Axles.

Strength, efficiency, accessibility, long life take their toll of high costs.

They are built into Timken Axles.

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT, MICHIGAN







TIMKEN AXLES



NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Williams Lubri-Reservoir Universal Joint

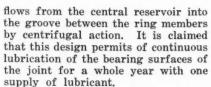
THE universal joint herewith illustrated has been developed and placed on the market for original equipment on passenger cars and commercial vehicles by the Automotive Corporation of America, Baltimore, Md. As may be seen from the illustration, the joint consists of two forked members and two ring members, the two ring members being held together by a shroud which is crimped over them and is said to hold them together more firmly than would bolts or rivets.

The feature of the joint is in its lubricating means. A groove is turned on the joint surface of each of the ring members, about midway between the inner and outer edges, and when the rings are assembled together by the shroud, these grooves form an oil reservoir. There is also



an oil reservoir in one of the forked members, which is chambered out and provided with a cover plate electrically welded on. The oil reservoir in the forked member communicates with that between the ring members by radial holes drilled in the two trunnions of the fork and through a radial hole in each trunnion, ending on the outside in a groove in the trunnion opposite the groove in the ring members.

Oil is used for lubrication, and the supply within the universal joint is replenished through a radial hole in the hub of the forked member which contains the oil reservoir, closed by a headless screw. In operation, oil



Another advantage claimed for this joint is that it is not necessary to separately lubricate the splines of the sliding joint. This is due to the fact that the reservoir is located over the hub of the sliding joint and is provided with radial holes to the bottoms of the splines, through which oil can seep to the sliding surfaces.

G. P & F. Pour-Klean Container

EUDER, PAESCHKE & FREY CO., Milwaukee, Wis., has placed on the market a pouring container for paints, varnishes, oils, chemicals and other liquids. This Pour-Klean has part of the top deflected at a 45-degree angle, out of which a pouring spout extends. For shipment and when not in use this telescopes inside the container top. When in use, the spout is simply pulled out to full length. Because of the slanted portion of the cover, the spout then stands tilted, the end just clearing the container side wall. The spout is held firm by bearings above and below the ring.

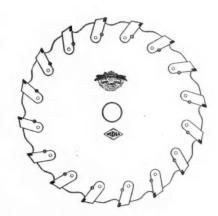
Difficult Material Cut By Tungsten Carbide Saw

UTTING difficult stock such as wallboard, composition fibre insulation and similar material, is being successfully accomplished by a new Widia Tungsten-Carbide tipped inserted tooth saw made by the Simonds Saw and Steel Co., Fitchburg, Mass.

burg, Mass.

A Widia tipped saw installed in a plant in October, 1930, cut asbestos

composition brake-lining for eight months before it was resharpened and then not over 0.014 in. was removed from the top of the tooth. Formerly in this factory, carbon steel saws cutting five pieces at one time had to be resharpened every



hour. The Widia Saw cut 15 pieces at one time over a period of eight months. In another plant for over two months one of these saws has been cutting sound-proofing board with cement binder. More than 50,000 ft. of one and two-inch thicknesses have already been cut without dulling this Widia saw.

Allsteel Making Verson Presses

CCORDING to a recent announcement the well-known line of Verson steel presses now is being manufactured by the Allsteel Press Co., Chicago, Ill. Under the new setup, the presses are of all steel, welded construction, built up from plates. It is interesting from the user's point of view to note that this welded all-steel construction permits many slight modifications in structure to satisfy individual requirements.

Hercules Heavy Drill and Reamer

CCORDING to a recent announcement, the Buckeye Portable Tool Co., Dayton, Ohio, has added the Hercules No. 287 heavy-duty drill and

reamer to its present line of portable air tools.

It is also made for nut driving. Its weight is 40 lb., which is approximately half of the usual weight of tools of its capacity. The No. 287-3 Drill and No. 288 Nut Driver have a speed of 120 r.p.m. The No. 287-5 Drill and No. 288-5 Nut Driver have a speed of 68 r.p.m. The drill is equipped

with a No. 5 Morse Taper Socket, and the Nut Driver with a %-in. square spindle. Feed is controlled by a ratchet wrench; a square handle or breast plate can be used in place of the ratchet



